Building capacity in climate change policy analysis and negotiation: methods and technologies

Other

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A report prepared by

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for the United Nations Institute of Training and Research
Climate Change Capacity Development Project (C3D)

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We are grateful to David Wallace, for his help in reviewing relevant training tools, activities, resources and courses in section 4.

We are also grateful to those OU colleagues whose work we have quoted here, particularly Dave Humphries of D833; Patrick McAndrew, Doug Clow, and Josie Taylor of the OU's Knowledge Network; Robin Mason in relation to globalisation of education; Martin Weller in relation to approaches to learning online; and Mary Thorpe in relation to communities of practice.

In addition, in response to specific requests from C3D partners on how the OU approaches the design of online learning, a great many colleagues around the OU have contributed reflections, case studies, accounts of their roles in course design and delivery, and resource estimates. This report consequently contains much material that has never previously been brought together in such a way. We are grateful to our colleagues for these contributions.

Finally, we are grateful to UNITAR and the C3D centres for their comments on previous drafts of this report.

Executive Summary

This report is written for the United Nations Institute of Training and Research (UNITAR) Climate Change Capacity Development Project (C3D). The report considers methods and technologies to help the C3D partners increase capacity with respect to negotiating effectiveness in the field of climate change, and to increase collaboration with relevant stakeholders. It also identifies opportunities, barriers and constraints with respect to these methods and technologies.

The report firstly considers what the UK Open University (OU) has learned about creating and running online courses, with a view to helping the C3D project team think about how ICT-assisted distance learning could be implemented. It is concluded that effective learning online requires a pragmatic mix of technologies and pedagogies. Examples are given from OU courses.

The report also considers the potential of online technologies to support kinds of learning *outside* online courses, and in particular, communities of practice. A range of ICT-based knowledge management strategies to help C3D project partners strengthen their capacity building efforts over the long term are highlighted.

The report then reviews tools, activities, resources and courses relevant to the C3D topics of climate change and sustainable development; and identifies a gap in relation to packaged training courses supported by an online community.

Finally, the report identifies specific opportunities and barriers in each of the three C3D centres in relation to the use of ICTs in pursuit of C3D's overall objectives. In particular, it provides general lessons on the current status and future prospects regarding use of ICTs to address specific training needs in the three regions, identifies options for further integration of ICTs into the overall project and provides concrete proposals for distance learning on climate change for the project partners.

Specific proposals include:

1. the funding of Critical Readers to help improve the materials, to enhance the pedagogical design of teaching, and to build in-house course development capacity;
2. the funding of Media Developers, to develop software, websites and audio-visual components based on the work of the centres;
3. professional development for the centres' online tutors.

Contents

1. Introduction

1.1 Overview of C3D project objectives and expected results

The global objectives of the C3D project are as follows:

- An improved participation of developing countries (non-Annex I Parties) in the UNFCCC process;
- A timely implementation of the UNFCCC and Kyoto Protocol by developing countries;
- A better co-ordination & integration of national climate policies with sustainable development policies;
- A contribution to sound implementation of EC and bilateral aid to developing countries in the field of climate change.

The expected results include:

- The development of training programmes on policy analysis and negotiation, in the field of Climate Change by the regional partner organisations, thus reducing dependence on institutes based in the industrialised countries for skills building and capacity development. To this end 10 to 20 trainers will become available in each of the three centres, all having gone through an intensive training course developed, designed and implemented by the project.
- South-South collaboration between the regional partner countries and possibly beyond.

In the longer term, the expected results or impacts of the project include:

- Increasing and sustaining the regional partners' abilities to develop and deliver training programme activities; attract high-level government officials (national focal points and other concerned actors) from neighbouring developing countries; and successfully transfer skills and know-how to trainees.
- Increasing the capacity of developing country officials to effectively integrate into the intergovernmental climate policy debate; effectively follow up at the national level in order to meet their obligations under the UNFCCC; and integrate climate change policies in the overall dimensions of sustainable development.

1.2 The Open University's Terms of Reference

Established in 1969, the UK Open University has become a pioneer and world leader in the development and application of distance learning technologies. It remains at the forefront of new technological developments around the use of the web and other Information and Communication Technologies (ICTs) to support learning and training. In particular, the University has pioneered highly successful training at the professional level in the field of sustainable development.

The OU's contribution to the project draws upon specific expertise across a range of disciplines including climate change politics and policy analysis; sustainable development; knowledge management; social, collaborative and interactive learning and the use of ICTs; and interdisciplinary issues around the focus of the digital divide.

The UK Open University, is taking the lead in carrying out a study on the potential of ICT-related distance learning in the field of climate change policy analysis and co-ordination and negotiation (Activity 8 within the overall project involves a study on ICTs to promote interactive distance learning.)

The terms of reference are as follows:

"In cooperation with the Open University (UK), the three regional partners and UNITAR will undertake a study to: (1) identify suitable methods and technologies to match the specific training needs of the developing country user groups in the African and Asia regions to increase their negotiating effectiveness in the field of climate change through ICT: (2) improve climate negotiator capacity to leverage participation and collaboration among relevant stakeholders at their national and regional level through ICT; and (3) identify opportunities, barriers and constraints to the use of various methods and technologies in each regional centre".

Specific deliverables included:

- Autonomous, supported student-centred modes of online learning + QA Methods; (Section 2)
- Empowerment of online learners (Section 2)
- ICTs as an environmental negotiation tool; conflict resolution (Section 2)
- Collaborative and interactive learning online; (throughout the study)
- Web monitoring and facilitating processes (Section 2)
- Representation of inter-related complex issues using animations and visualization. (Sections 2 and 5)
- An external survey of related resources (Section 4)
- General lessons on current status and future prospects regarding use of ICTs to address specific training needs in the three regions (Section 5)
- Identification of options for further integration of ICTs into the overall project (Section 5)
- Concrete proposals for distance learning on climate change for the project partners (Section 5)

1.3 Criteria for success

Successful outcomes for the OU contribution to the overall project are indicated by:

- There is a good match between the centres' capacity building needs, ICT choices, pedagogic choices and training outcomes.
- We help draw out practical lessons with wider relevance to capacity building activities in relation to climate change training needs in the three regions.

1.4 Methodology

The desk-based study involves a multidisciplinary team from the OU's Faculty of Technology and Institute of Educational Technology. Biographies of the team members are included at the end of this introduction. The team leader, Dr Stephen Peake, also attended and participated in the following meetings:

- Project Management Committee, Bonn, June 2003
- Project Management Committee Meeting, 7-8th December COP9 Milan, December 2003
- Project Steering Committee, Bonn, June 20th 2004
- Project partners meeting in Buenos Aires, COP10, December 2004

Informal internal OU briefings among the team were held after each meeting of the C3D Management Committee.

The following three principles guided the OU team's approach to the project:

- To work in close collaboration with UNITAR and the three centres.
- The study should emphasise the evaluation expertise of the OU and its wider expertise in distance learning and the use of ICTs.
- The OU will not promote/provide specific tools/platforms or approaches but will play the role of "honest broker".

The preparation of the report was approached in several phases:

Phase I: Monitoring of ongoing project outcomes (June 2003 to August 2004). In particular, attention was given to the results of the training needs assessments conducted by UNITAR and the preparation of training materials by the three centres. During phase I, the OU established a dialogue through consultations with UNITAR and the three training centres to assess needs. In this period, the OU team met regularly and monitored the project outcomes as they emerged.

Phase II: Materials gathering, research and report writing (September 2004-November 2004). The materials gathering process involved identifying materials from the following OU centres: The Knowledge Network, Knowledge Management Institute, Institute of Educational Technology, Learning and Teaching Solutions, various relevant courses. An external consultant was contracted to conduct a survey of ICT-based learning materials related to C3D topics being used outside the OU.

Phase III: After review and feedback from the three centres and UNITAR, preparation of final report (December 2004-February 2005).

Two aspects of the terms of reference changed during the course of the project:

- It was agreed from the start that the limited funding for the OU activity meant we would did not have the capability to "test a pilot video networking capability for the regional centres".
- The task of "specification/identification of suitable platform to match needs of each of the three centres" was taken on by UNITAR

The OU component of the C3D project is relatively small in terms of funding, but potentially very strategic in terms of its contribution to the project aims and outcomes. The bulk of the OU input to the project is an in-house data-gathering exercise. Without additional funds to cover face-to-face interactions with members of each

centre, a wider variety of consultancy methods for helping centres with their capacity building/distance learning needs was not available.

A key element of the OU's approach as a strategic partner in the project has been to delay for as long as possible Phase II (internal materials gathering) until the centres had begun to produce examples of the types of materials and pedagogical issues they face. This was so as to target the OU's assistance in as focused a way as possible on the particular needs of the centres.

During 2003, the partners were asked to indicate any "pressing capacity needs" for the delivery of training programmes related to topics within the scope of the project (climate change, negotiation, policy analysis) in the near future. UNITAR's document *Synthesis of Needs Assessments Conducted by Partner Institutes* identified the following pressing needs:

- Assistance in revising existing pedagogical materials to promote a more interactive and stimulating methodology.
- Assistance in designing appropriate adult training materials
- Assistance/training in pedagogical design for distance learning
- Training of trainers for distance learning

The aim of the remainder of this report is to provide appropriate and timely information to build the capacity of partners to better equip themselves in the future in these areas.

1.5 The OU Team

Dr Stephen Peake

Stephen Peake develops and applies requisite multi-media and ICT pedagogical methods and tools for the Open University's suite of interdisciplinary courses around environment and development. Dr Peake has over 15 years professional experience in the fields of energy, environment and climate change at the international level. He is a former official of the International Energy Agency in Paris and the United Nations Framework Convention on Climate Change, Bonn. He has worked with developing country negotiators and regional experts in the context of the international climate change negotiations. He has facilitated negotiations and capacity building activities in the areas of (i) technology transfer, (ii) vulnerability and adaptation options assessment and (iii) information systems to support implementation of climate change.

Dr James Aczel

Dr. James Aczel is Director of The Open University's Knowledge Network, which promotes knowledge exchange about teaching and learning. He is currently working with colleagues at Cambridge University and MIT on a related project. He is also Lecturer in New Technology in Teaching, and has taught on the OU's pioneering MA in *Online and Distance Education*, and on its MSc in *Research Methods for Educational Technology*. James has a doctorate in Educational Studies from the University of Oxford, and he has been involved in several research projects investigating ways to increase the educational value of software and online teaching. In a varied working life, he has been a schoolteacher, a teacher trainer, a tutor at Oxford University, a software developer at IBM, and an IT manager for an economic

analysis firm. His research interests include the learning of formal reasoning, and Popperian psychology.

Dr Pascale Hardy

Dr. Pascale Hardy is Senior Research Manager in the Institute of Educational Technology (IET) at the Open University, UK. She is responsible for the management of a number of international RTD projects in the Framework Programme. Before joining IET, among other positions as project manager, she spent 6 years as a project co-ordinator at the European Commission Joint Research Centre in Seville, Spain. She gained her PhD in Social Sciences from the Gregoriana University, Rome, Italy where she studied the theory of scenario building and foresight studies. She is currently preparing a Master in Business Administration (MBA) at the Open University. Her research interests are in strategic analysis of educational research and policy development, knowledge management and learning organizations.

1.6 Structure of this report

This introduction has given an overview of C3D project objectives, listed the Terms of Reference for the OU team, and outlined the approach adopted.

The next section considers what the OU has learned about creating and running online courses, with a view to helping the C3D project team think about how ICT-assisted distance learning could be implemented. Examples are given from OU courses.

Section 3 considers the potential of online technologies to support kinds of learning *outside* online courses, and in particular communities of practice. This section highlights ICT-based knowledge management strategies for helping C3D strengthen long-term capacity. The notions of the “learning organisation”, “community tools” and “competitive advantage” are briefly introduced.

Section 4 reviews tools, activities, resources and courses relevant to the C3D topics of climate change and sustainable development.

The final section identifies specific opportunities and barriers in each of the three C3D centres in relation to the use of ICTs in pursuit of C3D’s overall objectives. In particular, it provides general lessons on the current status and future prospects regarding use of ICTs to address specific training needs in the three regions, identifies options for further integration of ICTs into the overall project and provides concrete proposals for distance learning on climate change for the project partners.

2. What have we learned about online courses?

SUMMARY

- Effective learning online requires a **pragmatic mix of technologies**:
    - **Presentation components** include course materials and databases. They can include resources such as documents, diagrams, photographs, audio, video, PowerPoint presentations, and animations. They can be used alongside textbooks, printed study guides, offprints and multimedia resources on CD-ROM. Putting course materials online can increase accessibility and flexibility, and make the materials easier to update, personalise, and reversion. Database subscriptions can keep course content fresh and relevant. However, when it comes to reading text, students tend to prefer paper to screen; and workload needs to be monitored.
    - **Communication components** include tutoring and student forums. They can use technologies such as asynchronous text-based conferences, instant messaging, blogging, email, audio-conferencing, video-conferencing, shared whiteboards, and document discussion tools. Online communication can provide students with more convenient ways to interact with their tutors and peers. Text-based discussions offer the potential of increased attention to text, greater flexibility, more diversity, and a reduced sense of isolation; however they also lack body language, tone of voice and (arguably) emotional weight. They also require a slower pace, more reading, and greater selectivity in what to read.
    - **Feedback components** include formative assessment and applets. Technologies to support feedback include CD-ROMs, DVDs, online gameworlds, virtual labs, and automated response systems. Such technologies allow students to test understanding and so build confidence. However, feedback components are typically expensive to develop and they can be ineffective if the feedback is inappropriate.
    - **Administration components** include enrolment, calendaring, news, and record management.
- **Students vary** in their valuing of online learning. Logistical problems typically cause high irritation. There is no definitive evidence than online learning is superior to other methods.
- A **popular model** at the OU is:

- DVDs/CD-ROMs (for video clips, audio clips, high resolution images and applications)
- web (for text that needs regular updating, and for online databases)
- asynchronous conferencing (for tuition, collaborative work, and support)
- textbooks or print materials (for lengthy reading)

- A **sound business plan** is essential, taking realistic account of production costs, student demand, technological change, student access, reversioning potential, and social drivers such as the knowledge economy, globalisation, consumerism, demographics and governmental policies. High-quality course materials, tutoring and infrastructure do not come cheap. Beware of making choices based simply on vogue.
- **Trends in pedagogic practice** are towards
  - more active learning, particularly involving discussion and collaboration;
  - faster, more flexible learning, particularly at work;
  - skills in locating, evaluating, analysing, synthesising and applying knowledge, rather than rote learning.

  However these trends are neither inexorable nor culturally neutral; nor does educational fashion necessarily ordain a pedagogical approach that is suitable for all students, for all educational aims and for all business models.
- The **psychological study of learning** can provide some insights, particularly in relation to topics such as motivation, memory, group dynamics, personality and identity; but "findings" should not be treated uncritically, especially if students' prior knowledge and the specifics of the topic are ignored.
- **Learning theories** can be useful in conceptualising course design decisions:
  - **Behaviourism** emphasises skills, conditioned learning and memory.
  - **Constructivism** emphasises the learner's active role in constructing knowledge by reflection on experience.
  - **Social constructivism** emphasises context, culture and communities.
- A number of **learning dimensions** can help refine the pedagogy of a course:
  - **Individual versus social**: a balance of opportunities for private learning and for group communication and collaboration
  - **Conditioning versus reflection**: a balance of opportunities for conditioning processes and for reflection on experience.
  - **Information versus experience**: a balance of opportunities for receiving information and for practical activities.
  - **Structure versus autonomy**: a balance of opportunities for expert guidance and for self-directedness.

    - **Generic versus personalised**: a balance of opportunities for differentiation by outcome and by task.
- A judicious combination of **pedagogical approaches** can be most effective:
    - **Resource-based learning (RBL)**: exploit a variety of data sources.
    - **Collaborative learning**: small groups of students work together.
    - **Problem-based learning (PBL)**: start with problems not information.
    - **Narrative-based learning**: use the power of stories and case studies.
    - **Community of practice**: use authentic activities for apprenticeship.
- The "**assessment strategy**" needs to balance student preferences with the certification of standards. Over-assessment must be avoided, but course elements tend to be valued more if they are assessed.

2.1 Scope of this section

This section considers some questions relating to creating and running online courses, with a view to helping the C3D project team with its decision-making in relation to exploiting online technologies with the aim of increasing capacity in the field of climate change policy analysis and negotiation.

This section does not focus on wider issues of online education outside formal courses. For example, it does consider in any great detail the potential of online technologies to support communities of practitioners. This potential is considered in the next section. Nor does it closely examine the model offered by MIT's OpenCourseWare initiative (http://ocw.mit.edu), which aims to make MIT's learning materials freely available to self-learners across the world (900 courses available as of September 2004). Such a model might be appropriate as a fallback option if it were decided *not* to proceed with some kind of online course.

The term "e-learning" is often used in discussions of this nature. While the term is used by some to refer just to web-based or internet-based educational opportunities, others use it to refer to all kinds of electronic learning, including the use of desktop software and mobile devices. Although reference will be made to these other kinds of technologies, the focus in this section is primarily on what the OU has learned about the creation and running of online courses rather than about learning with electronic technologies in general.

A further area that is mostly outside the scope of this section of the report is technical detail about the technology itself. In contrast to the situation even just a few years ago, many of the instances described here can be implemented using a variety of software architectures, platforms, frameworks and tools. Technological solutions vary from expensive off-the-shelf products sold by leading vendors, to free general-purpose open source platforms. While there are significant differences between such technologies that render it vital to weigh up very carefully their respective advantages and disadvantages, we would argue that such an analysis should preferably come only

after the pedagogical aims, principles and methods of any online course have been ascertained, at least in broad terms. It is these pedagogical aspects which this section endeavours to help clarify.

Comparisons with face-to-face and traditional distance forms of university teaching are inevitable; however it is assumed that the central problem here is not one of converting a traditional form of teaching to an online form (the issue which existing universities have typically faced) but one of creating a course (or courses) *ab initio*.

Note that in this section, a distinction is sometimes made between those who create online courses ("course designers") and those who facilitate discussion and mark assessments ("tutors"). The course designers usually select the technologies to be used, write or commission the course materials, provide a structure of activities for the course, and set the assignments. The tutors, meanwhile, have contact with students. This reflects a typical division of responsibilities at the Open University. However, other course providers might divide responsibilities differently, or the course designers and tutors might in practice be the same people.

Finally, it should be noted that it is a tall task to capture adequately the key lessons from the OU's extensive experience in a brief report, and the choice of illustrations is necessarily selective. A lot has been learned, but the findings are not straightforward. So for reasons of time – both the authors' and the readers' – it does not go into any great detail on the extensive and sometimes conflicting research, particularly in relation to the costs and effectiveness of online education. Moreover the arguments made are essentially personal, and do not necessarily represent the official views of The Open University.

SUMMARY

- Some kinds of learning might be more appropriate **outside online courses** (see next section).
- "**e-learning**" can mean learning online, or learning with electronic technologies in general.
- Weighing up the pros and cons of technological solutions should not take precedence over **clarifying the aims, principles and methods** of a course.
- In this report, those who create courses are labelled "**course designers**", those who facilitate discussion and mark assessments are labelled "**tutors**".

The first lesson expressed here is that for many courses, a mix of technologies appears preferable to an entirely online solution. A number of examples are provided from OU courses. A second lesson is that the design of courses needs to be guided as much by a sound business model as by a sound pedagogical model.

We then outline trends in technology and in pedagogical practices and some possible educational limitations of online learning. Following this, we consider how the construction of online courses can build on the psychological study of learning, on

different learning models and on selected pedagogical approaches. A few points are then made in relation to summative assessment.

2.2 A mix of technologies

Open University courses fall into three categories with respect to online usage. Around 10% are almost completely online, such as T171 (*You, Your Computer and the Net*) and H802 (*Applications of Information Technology in Open and Distance Education*); about half require the student to have online access for delivery of course materials and tutorial support; and the rest allow the student to use online services if they wish.

This diversity in online usage is because the OU designs its courses to give students the flexibility to study in their homes and workplaces, and each team that creates an OU course (called a "course team") selects a mix of learning and teaching technologies appropriate to the subject matter of that course and the learning needs of its students. We constantly strive to produce an exciting, motivating and effective learning experience for students. We also strive to widen access to higher education by helping students to overcome barriers to their study.

Consequently, the OU is simultaneously the UK's largest university, with over 200,000 students; and it is also one of the UK's five best in terms of teaching quality (Source: Sunday Times league tables, 2004), ranking higher than Oxford.

This principle of using a mix of complementary technologies – old and new – means that course teams are constantly examining the value that each technology brings to the students.

SUMMARY

- A **mix of technologies** can often be preferable to an entirely online solution.

Online technologies are used to provide students with opportunities for studying in new ways. In particular, there are more possibilities for presentation, communication, and feedback; with greater potential for personalisation, pedagogic innovation and flexibility. We now look at these opportunities in more detail.

2.3 Presentation components: course materials and databases

For example, traditionally, course materials would predominantly have consisted of textbooks, offprints and printed study guides, sent through the postal system. Now, all textual materials are simultaneously available in e-Book and pdf formats, enhancing accessibility for disabled students and flexibility for all students. For courses with subject matter that changes quickly, students no longer have to tolerate out-of-date material, because webpages are more easily updated than books or printed materials, and because course teams can provide tailored access to a wide range of online library

databases, catalogues, journals and e-books. Such online resources are not limited to text and graphics: they can also include audio and video clips.

These presentation components, then, lend themselves to making “resource-based learning” (see 2.15 below) a feasible course design option.

So, for instance, in 2003, the OU introduced the world’s first online postgraduate Music course. Students on this course have access to a unique and specially-created online ‘music research environment’ that includes a large bank of musical and other databases (see Figure 1). The University buys permission to use these commercial databases, so that students have access to them at home 24 hours a day for the entire academic year. Many databases contain full-text articles and audio clips. Students can also view research degree theses online.

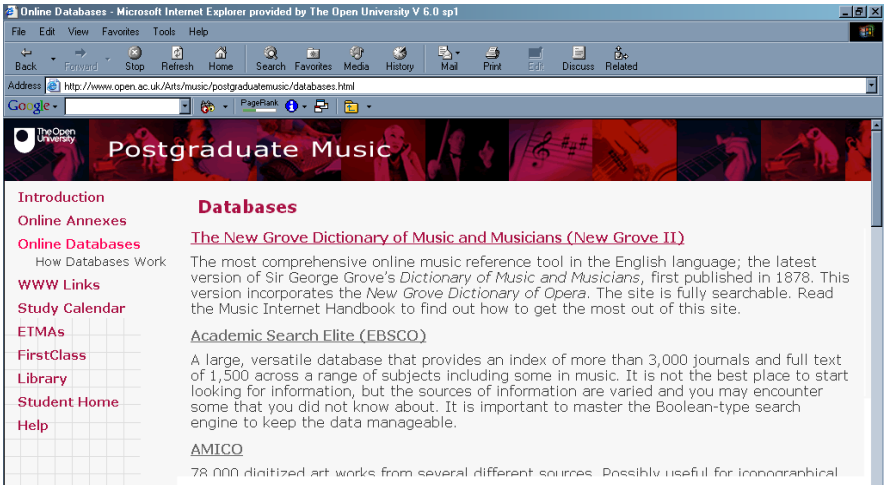

Figure 1: Postgraduate Music courses provide access to a large number of databases

In addition, the course also includes web links to hundreds of music websites (see Figure 2) selected by the course team. Each link is accompanied by the course team's commentary on the site, and categorised. Bibliographies are also provided online so that they can be regularly updated.

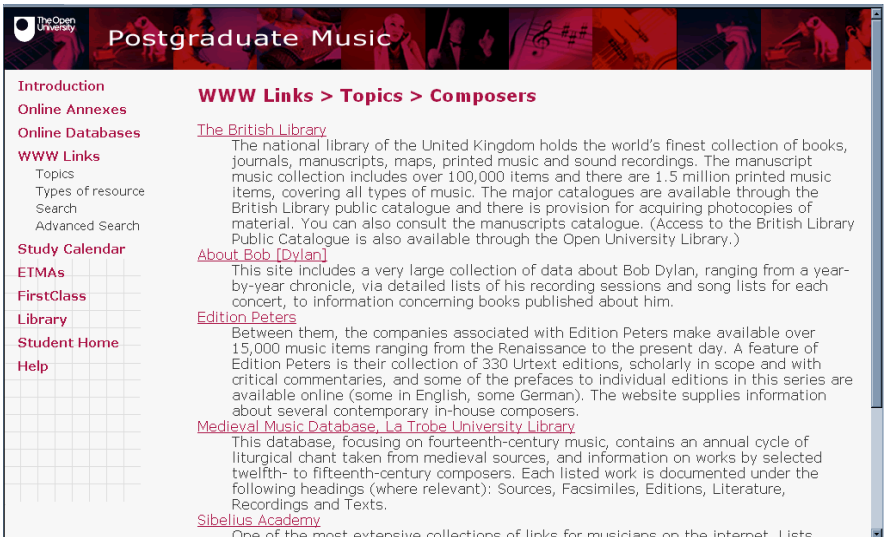

Figure 2: Examples of web links with commentaries

For further information on the way the OU's online postgraduate Music courses exploit online technologies, please see
http://www.open.ac.uk/Arts/music/postgraduatemusic/

Another advantage of putting course materials online is that this can facilitate re-versioning of courses to suit the specialist needs of particular groups and markets.

Nevertheless, online databases do not necessarily supersede CD-ROMs or DVDs. For example, the second-level course A295 (*Homer: Poetry and Society*) provides a CD-ROM that enables students to access in one place texts, activities, photos, maps, audio, video and other resources (see Chambers & Rae, 1999, for further details). It contains around 700 000 words of text, about 300 images, 22 video clips and 70 minutes of audio. At a time when internet access for many students is still dependent on dial-up connections, such a resource is more convenient offline than online. This is reflected in the fact that although about 50% of OU courses make some form of online learning compulsory, the University is still shipping over 200 distinct CD-ROM and DVD software titles a year, amounting to almost half a million disks.

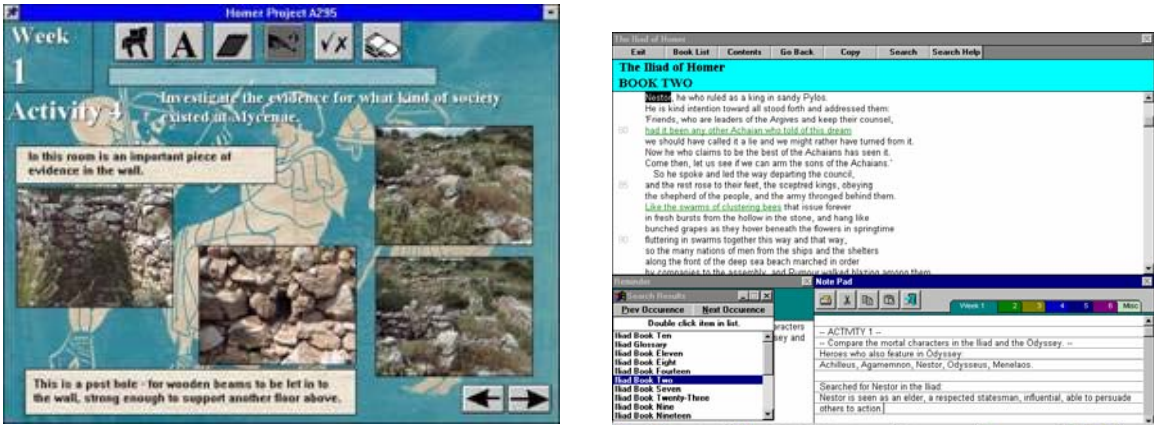

Figure 3: Screenshots from the Homer CD-ROM used in A295

Recent innovations in the area of presentation components include experiments in adaptive, personalised search facilities, to help locate appropriate online information resources, delivered according to the student's personal requirements.

SUMMARY

- **Online presentation components** include course materials and databases. They can include resources such as documents, diagrams, photographs, audio, video, PowerPoint presentations, and animations. They can be used alongside textbooks, printed study guides, offprints and multimedia resources on CD-ROM.
- **Putting course materials online** can increase accessibility and flexibility, and make the materials easier to update, personalise, and reversion. However, when it comes to reading text, students tend to prefer paper to screen; and workload needs to be monitored.
- **Database subscriptions** can help keep course content fresh and relevant.

2.4 Communication components: tutoring and student forums

An option in many courses is face-to-face contact with part-time, locally-based tutors (called "Associate Lecturers"). There are some 7000 tutors, along with a network of 330 study centres in the UK and overseas. Most of the OU's students live in the UK, but there are about 30,000 students throughout Europe and the rest of the world. There are also many students who are unable to attend face-to-face tutorials because of transport difficulties, because of work and family commitments, or because the course is not large enough to have a tutorial running locally.

For many students, then, asynchronous text-based computer mediated conferencing (CMC) and email provide more convenient ways to interact with their tutors (see Figure 4). In CMC, the student can choose for himself or herself which discussion threads to read, post a response, and then come back a little later to see how the subsequent discussion has progressed.

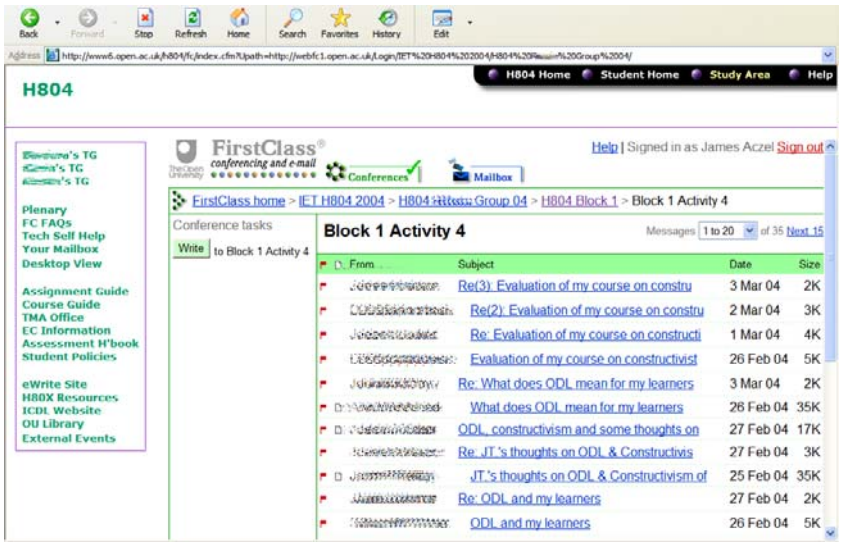

Figure 4: Example of asynchronous text-based conferencing

Most OU students use computer conferencing to at least some degree, whether or not face-to-face tutoring is available on their course. Such systems are particularly useful in bringing together students from diverse backgrounds to communicate more easily with each other and with their tutors than would be possible in a traditional tutorial. Such conferencing also tends to direct attention onto text, which can be an advantage; assists students working in different time zones; and allows more specialised discussions. Pedagogic models such as "collaborative learning" and "problem-based learning" (see 2.15 below) are more easily facilitated.

For instance, the course T171 (*You, Your Computer and the Net*) became the most popular computing course in the world in its first year of operation (2000), when 10,000 students enrolled. The course combines web-based resources with online conferencing to create an integrated learning environment. The assignments require evidence of participation in online discussions.

For more information on how T171 works, please see
http://www3.open.ac.uk/courses/bin/p12.dll?C02T171

Another type of conferencing is synchronous voice-based conferencing. The OU has used a piece of software called Lyceum, which also includes multiple rooms, a collaborative whiteboard, voting, and document annotation (see Figure 5).

The Open University is the largest provider of part-time undergraduate language courses in the UK, and audio-conferencing has proved especially useful for such courses. Audio-conferencing has also been used to enable remote tutorials and collaborative group-work.

Of particular interest to the C3D project is the use of audio-conferencing in the postgraduate social science course *Environmental Practice: Negotiating Policy in a Global Society* (course code D833).

In D833, students engage in a simulation of negotiations at the UN, participating in nine 2-hour negotiation sessions. The role-play activity involves each student representing the interests of a different country, drawing on a "country profile" and relevant online resources. The course tutor acts as the Secretariat. Students take part in working groups and plenaries, collaborate on documents, use "whisper spaces" to conduct private negotiations, and take part in formal votes. Students are thereby able to experiment with and examine the processes of negotiation in the light of theory. However, as Thorpe, K. (2002) points out, there is a difference between playing the role of a diplomat and learning to be a social sciences scholar. It is therefore an important role for the teaching materials and the tutor to encourage students to objectify the processes.

Further details on the use of Lyceum are provided in section 2.17 below. For more information on the OU's synchronous conferencing software Lyceum, please see
http://kmi.open.ac.uk/projects/lyceum/

Another use of communication components is in the OU's third-level course U316 (*The Environmental Web*). Part of the course involves students looking at UK biodiversity maps, how they are produced and their limitations. Exploiting the wide distribution of OU students, the course asks students to go into their back gardens or local park and carry out their own biodiversity survey. Birds, dragonflies and woodlice are observed and recorded over a two-week period. Students then enter the data in a Biodiversity database website.

When all students have submitted their data, the database is processed to create maps of biodiversity that students are then required to analyse statistically as part of an assignment. Because students have collected the data themselves, they not only have a sense of ownership over the data and experience of working with others towards a common goal but they also have first-hand experience of the factors which limit the reliability of biodiversity surveys.

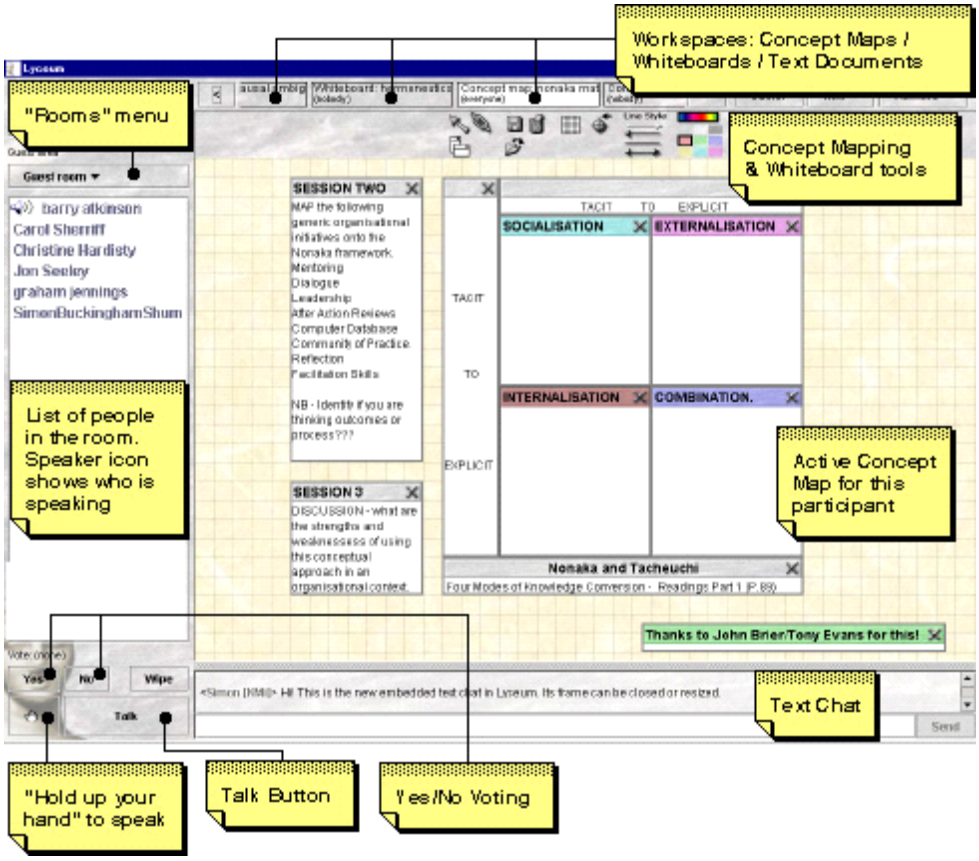

Figure 5: The OU's synchronous voice conferencing software Lyceum

More recent course innovations include the use of instant messaging, interactive web-casting, document discussion and blogging. All these forms of communication can help reduce the sense of isolation that distance learning sometimes engenders, and help students to see themselves as members of a community of learners.

SUMMARY

- **Online communication components** include tutoring and student forums. They can use technologies such as asynchronous text-based conferences, instant messaging, blogging, email, audio-conferencing, video-conferencing, shared whiteboards, and document discussion tools.
- **Online communication** can provide students with more convenient ways to interact with their tutors and peers. Text-based discussions offer the potential of increased attention to text, greater flexibility, more diversity, and a reduced sense of isolation.
- The OU course D833 (*Environmental Practice: Negotiating Policy in a Global Society*) includes a **role-play simulation of UN negotiations**.

2.5 Feedback components: assessment and applets

By “feedback components”, we mean course components that are overtly and primarily about providing students with the ability to test their understanding. The term “interactive technologies” is also often used.

Online assessment is growing in importance. Aside from any considerations of academic validation (which might or might not apply to the C3D project), it is not uncommon for courses to use computer-based formative assessment that allows students to evaluate and assure their progress at suitable points in their study and hence build their confidence as students. An example is S151 (*Maths for Science*), illustrated in Figure 6.

In addition, around a third of all OU courses allow formal assignments to be submitted via an internet-based application called the “eTMA” system; and tutors can also mark and return assignments electronically. The OU has also developed software to provide feedback to new tutors on the quality of aspects of their comments. The feedback provided by these formal assignments is seen as an important part of the teaching process.

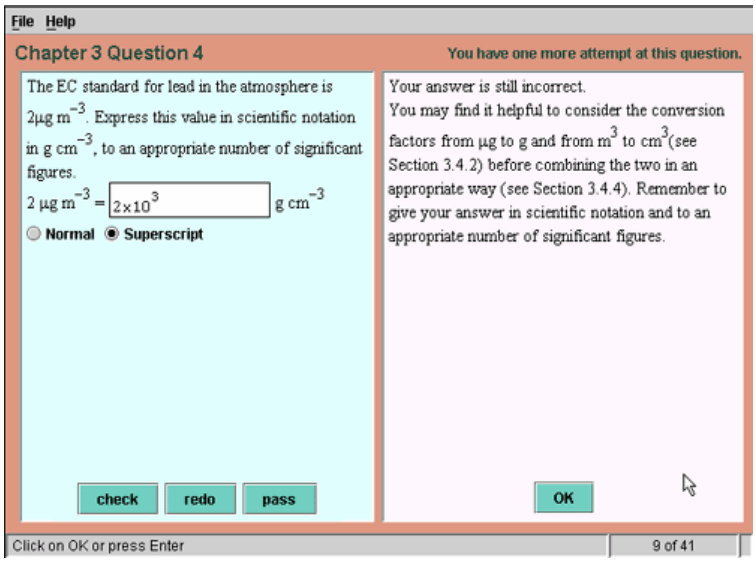

Figure 6: Example of question and feedback from S151

Online educational software encroaches on territory that was previously the domain of desktop software. Rather than the student having to install major applications on a computer (at home, a library, resource centre, or elsewhere), with the associated worries about security, incompatibilities and training, it is often possible for small, easy-to-use web-based applications called “applets” to provide the basic functionality. These applets can be designed to require little or no installation, to operate within the standard browser environment on a range of platforms, and to work embedded next to the relevant text. Examples of such applets include intelligent diagrams that direct attention and respond to user input (see Figure 7), voting, graphing tools, simple simulations, and manipulable models.

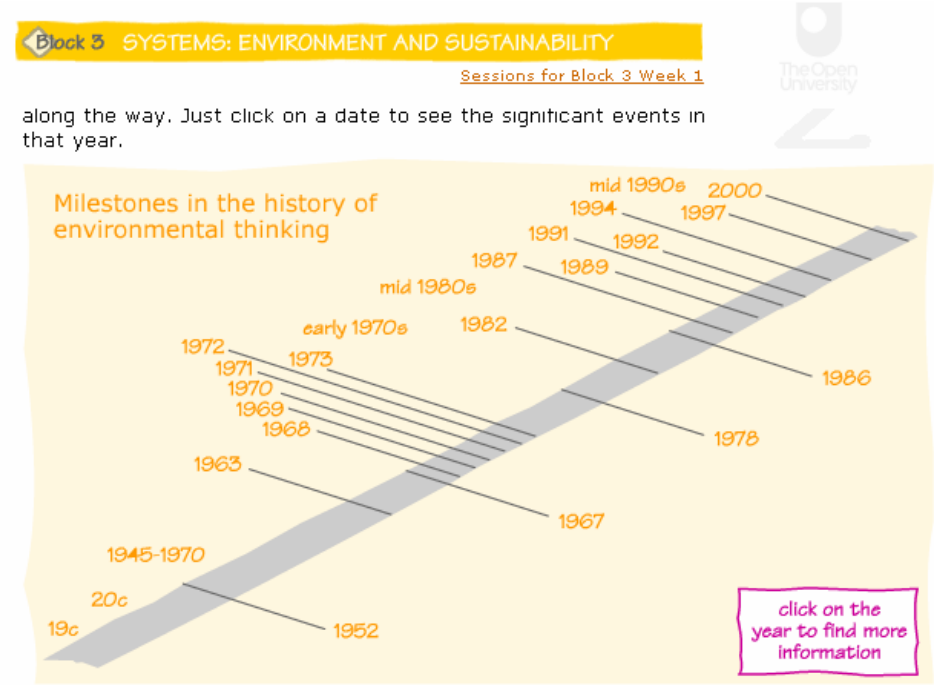

Figure 7: Example of an interactive diagram from T205

For examples of these kinds of applets, see the demo of the second-level course T205, and in particular, Block 3 (*Systems: Environment and Sustainability*) at www5.open.ac.uk/t205demo/public/

The value of feedback software can be illustrated by looking at one particular activity of many in the introductory course S103 (*Discovering Science*). The activity (see Figure 8) helps students understand the carbon cycle in basic terms by asking them to move a symbolic carbon atom from one reservoir (such as the atmosphere) to another reservoir (such as carbonate rocks) in turn, by describing the scientific process by which the transformation occurs.

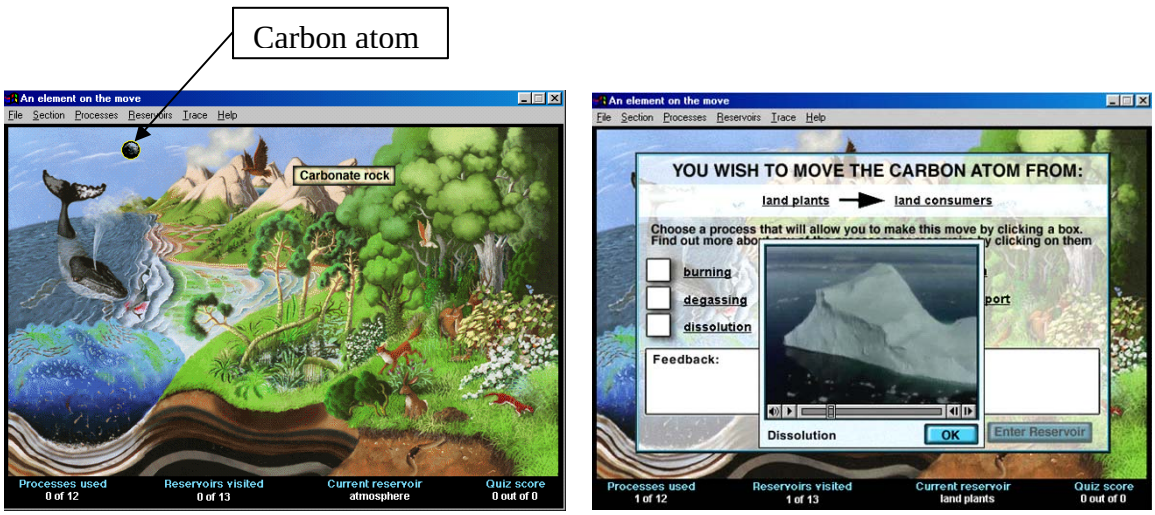

Figure 8: Carbon cycle activity in S103

So, if for example, the student is trying to move carbon from “land plants” to “land consumers”, a multiple choice of processes is presented. If the student is not sure what

a particular process is, they can ask for a video-clip explanation. Once the student feels confident about the whole carbon cycle, they can choose to do a quiz and test their understanding.

This basic responsiveness provides a simple feedback mechanism that can be extremely powerful, as students remark in evaluation studies of this kind of software:

> "Being interactive, you are forced to make decisions. And I found this very helpful in making me think very carefully about what was happening."
>
> "It's more enjoyable, more easily retained due to active learning and participation."
>
> "As it was interactive I found I was less likely to switch off while using it, so it helped me to retain information more effectively than video or book."
>
> "The CD format was an improvement over having to read many pages of text to achieve the same level of understanding."
>
> *Student comments quoted in Laurillard (2001, p. 5)*

Figure 9: Screenshots from the Galapagos CD-ROM in S103

The Homer CD-ROM described earlier also contains feedback elements, in that students are able to test their understanding via interactive questions (see Figure 10). Such interaction could easily be provided online, while at the same time drawing on the rich resources contained in the CD-ROM, opening up the possibility of a tutor or peers providing feedback on more complex student responses than could be easily parsed in software. Such responses might be generated by questions such as "Think of a modern novel that shares any of the Iliad's plot elements. What similarities do you see? What differences?"

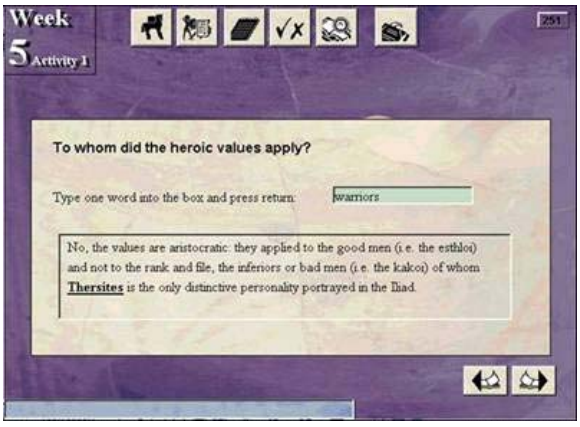

Figure 10: Interactive questions in the Homer CD-ROM used in A295

Another example from S103 is the Galapagos CD-ROM (see Whitelock, 1998, for further details), which is used to introduce some basic ideas in evolution by natural selection, although not to teach the theory directly. The main aim is to introduce students to some of the observation and note-taking skills often used in fieldwork, relating these skills to Darwin's work in the Galapagos Islands in the 19th century. The software requires students to make choices about where to observe, to identify and categorise finches using a field guide, and to make systematic notes.

Such a "virtual field trip" provides a range of video clips, audio clips, pictures, maps, articles, activities, and simulations. It has a number of advantages: it is more involving than text or a museum exhibit (one student described how the videos seemed to "bring the subject to life"); it is less expensive and time-consuming than travelling to the islands; it removes the risk of not observing a range of species; it allows observation of the conditions that pertained at a previous point in time (e.g. Darwin's expedition); and it focuses students' attention on the variables that are important for the particular course. It has the disadvantage that students do not usually obtain experience of the messiness, hands-on techniques, or fortuitous opportunities of physical fieldwork.

There are many examples at the OU of software to support virtual experiments. These have similar advantages and disadvantages.

An illustration of another type of feedback technology is provided by a program called "Jape", which is used by Computer Science undergraduates to learn logic (see Aczel et al, 2003, for more details). The software presents a symbolic conjecture to the student (see Figure 11), and the student then chooses a rule to apply to one of the lines. The software then shows the student to see the effects of applying the chosen rule. If the student thinks that the choice was a good one, they can then choose another rule, and so on, until (providing they continue to make good choices), the proof is complete.

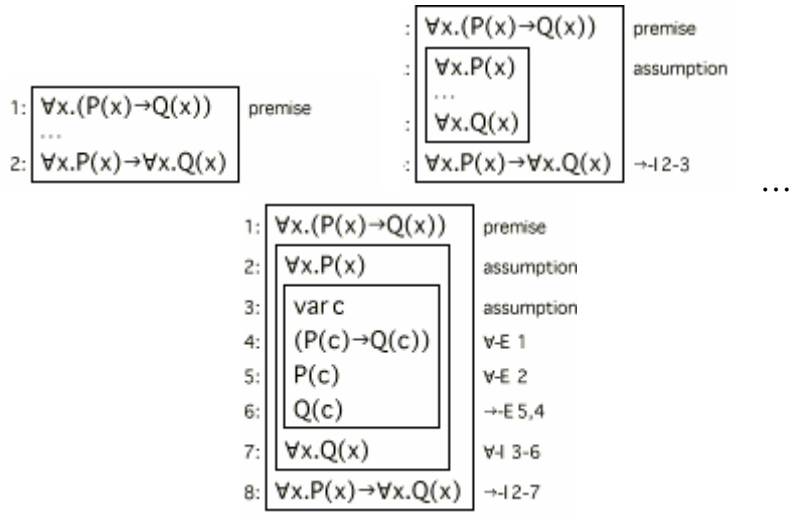

Figure 11: Proving in Jape

Students are able to test their understanding of the best rule to apply in a situation, because Jape provides instant and accurate feedback on the effects of the rule, and the freedom from have to write it all out laboriously on paper allows experimentation. The software also prevents users from making illegal moves (whereas on paper, illegal moves are often done accidentally), inhibits them from making certain

unhelpful moves, and provides subtle visual cues about whether a proof is heading in the right direction.

SUMMARY

- **Online feedback components** include formative assessment and applets. Technologies to support feedback include CD-ROMs, DVDs, online gameworlds, virtual labs, and automated response systems.
- Such technologies allow students to **test understanding** and so **build confidence**.

2.6 Administration components

These major components of online learning – materials, databases, tutoring, student forums, assessment and software – are supplemented by a range of other tools and services.

So, for instance, most courses now include an online study calendar, a feedback forum, a news service and frequently-updated online links. In addition, a range of online study guidance, taster materials and administrative services are now available. Students can find out where and when the nearest tutorials are held; download software; exchange views with other members of the student association; read the student newspaper; obtain academic transcripts; and book graduations. See Figure 12 for a typical course homepage.

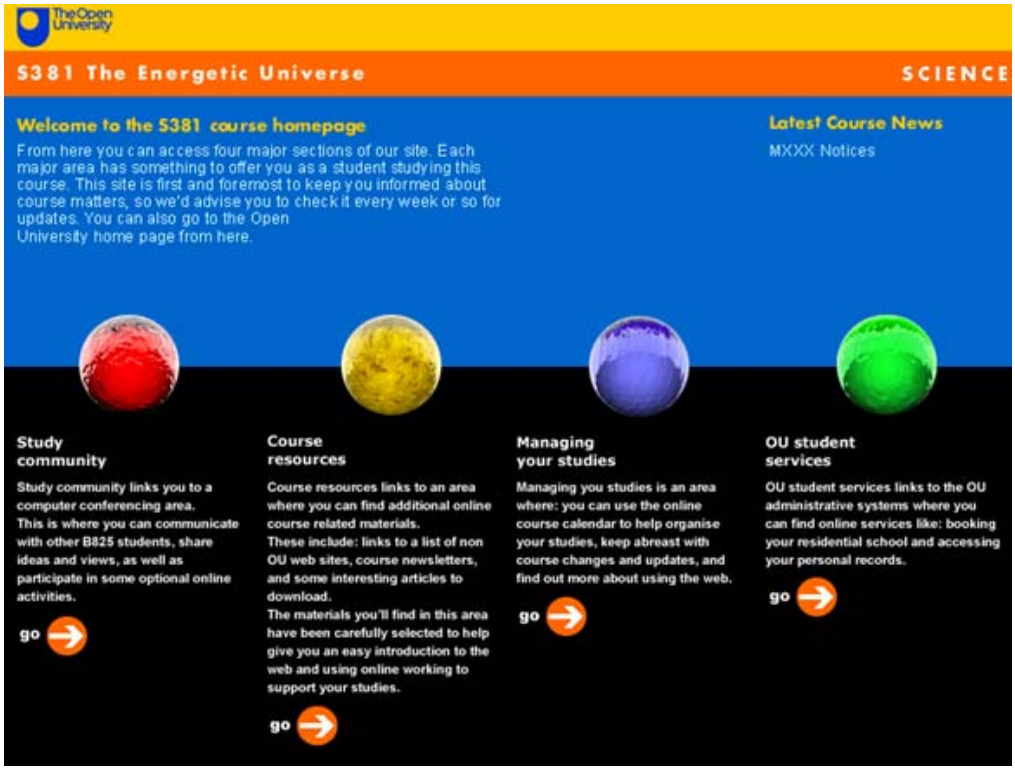

Figure 12: Typical course homepage

Students are using the web to enrol on courses in increasing numbers, and to manage their administrative records. However students registering for courses still tend to prefer using a paper-based form or the telephone than a webpage. This is despite there being a high rate of internet access (90% in 2003).

SUMMARY

- **Administration components** include enrolment, calendaring, news, and record management.

2.7 Getting the mix right

The OU recognises that online learning can be used extremely effectively for learning but like all other technologies, it needs to be used appropriately.

> "Open University courses are delivered as an integrated combination of media and methods, each chosen for its unique contribution to the learning experience. It is essential to provide the appropriate balance of media – text, audio, video, interactive simulations, database resources, IT tools, communication environments." (OU Learning and Teaching Strategy, 2002)

But what is the "appropriate balance" for a given course? One must even consider whether online learning is appropriate at all for the course:

> "… the Net has several characteristics that are beneficial in education. Firstly it gives access to a wide range of resources. Secondly it allows communication between students, educators and

> professionals to occur in a manner that makes interaction more likely (for instance by not having to arrange physical meetings) and encourages reflective contributions. Lastly, it gives flexibility as to time and distance. Unless the course content is itself focused on some aspects of the Net then the course pedagogy should be taking advantage of at least two of these factors, otherwise the question will be asked as to why that course is being delivered online." (Weller, 2002, p. 90)

At the OU, "web-intensive" or "e-intensive" courses are those for which all, or most, teaching and student support is delivered online. For example, the music course described earlier includes an offprints collection and an audio CD. Meanwhile T171, the course with 10,000 students, comes only with the course software on CD-ROM and a sheet of paper with the user's passwords. There is also a suite of 10-week online courses developed by the Technology Faculty. These courses require a time commitment of 10 hours a week. See http://tscp.open.ac.uk for more details.

Many courses mix the use of ICT with more traditional approaches. This is termed "blended learning". So, for example, the course S216 (*Environmental Science*) uses DVD technology to provide two virtual field trips: to the Teign Valley in Devon and the Sevilleta Wildlife reserve in New Mexico. The software use constitutes about 20% of the course, while the online use constitutes about 5% of the course. For further information on S216, see www3.open.ac.uk/courses/bin/p12.dll?C02S216

Some courses, such as S180 (*Life in the Oceans: Exploring Our Blue Planet*) make conferencing and use of websites optional. Others, such as S292 (*Explaining the emergence of humans*) make use of the internet compulsory for access to certain resources and for assessment.

Laurillard (2001) points to studies examining the percentage of students saying that they spent "a lot more" time than expected on different kinds of course components. The percentage for ICT-based course components is about *double* that of text. She also notes "With the addition of new media, there is inevitably a temptation to give the students more and more material." (p. 5). Yet if course designers do not take the opportunity to exploit the pedagogical potential of these technologies, the workload for students goes up without there being obvious educational advantages. Moreover, "Workload is one of the major reasons given by students who withdraw. It is important, therefore, to be very careful about achieving the right balance between print and Web material." (p. 5).

So rather than all courses becoming inevitably wholly online, this flexible combination of…

- DVDs/CD-ROMs (for video clips, audio clips, high resolution images and applications)
- web (for text that needs regular updating, and for online databases)
- asynchronous conferencing (for tuition, collaborative work, and support)
- textbooks or print materials (for lengthy reading)

… is proving a versatile model for course materials. Around half of OU courses use something like this model. The model provides a hybrid solution to the bandwidth problem, in that the media-rich materials are largely provided via DVD/CD or print, while the online components provide updates, interaction and access to third-party databases. Individual learning preferences are catered for by offering a number of

alternative routes through the course, rather than providing a large number of optional extra activities that add to workload.

The OU view is that there will always be a place for paper and face-to-face teaching for some kinds of learning activities.

So, for example, the course M206 (*Computing: An Object-Oriented Approach*) provided students with an interactive practical environment in which they were guided and given feedback; and this environment was integrated with Web resources, video, interactive multimedia, and print materials. Laurillard (2001) quotes some student feedback on this course:

> "The course deserved to have the highest praise for creating such a comprehensive, stimulating and enjoyable learning experience."
>
> "This media achieved its objective in my case, and was easy and enjoyable to use."
>
> *(Cited in Laurillard, 2001, p. 5)*

Yet the evaluation showed that students printed out a high proportion of the online material: 33% of the text of practicals, 45% of webpages, and 54% of the conference messages. This suggests that students, even computer programmers who are used to working at a computer screen, like to have the option of working from print rather than always from the screen.

In general, printed course materials are regularly the highest rated by students in terms of helpfulness, with around 90-95% of students rating them as "helpful" or "very helpful"; CD-ROMs and DVDs receive helpfulness ratings of around 75-85%; face-to-face tutorials 75%; web-based resources 60-70%; and tutorials via email, telephone and conferencing about 60%.

SUMMARY

- Effective learning online requires a **pragmatic mix of technologies**, combining multiple opportunities for presentation, communication, feedback and administration.
- A **popular model** at the OU is:
  - DVDs/CD-ROMs (for video clips, audio clips, high resolution images and applications)
  - web (for text that needs regular updating, and for online databases)
  - asynchronous conferencing (for tuition, collaborative work, and support)
  - textbooks or print materials (for lengthy reading)

All this raises questions, then, that are particularly pertinent to the C3D project: For a given course, how exactly should one choose the appropriate mix of technologies? What should be the balance between private study and discussion? How should one write the materials and structure the online tuition in such a way as to maximise effective learning?

We return to these central questions after consideration of the constraints and trends that course construction must take account. We first look at financial aspects.

2.8 A sound business model

It might seem peculiar in a report focusing on *pedagogical* guidance to flag the importance of financial considerations. However, evidence from a range of sources suggests that failing to consider issues of the cost effectiveness of different pedagogic strategies within the context of a sound business plan rapidly leads to the failure of these pedagogic strategies. Conversely, the design choices of an online course are often constrained by the available financial resources for production and presentation. These choices include the models of course materials, the modes of assessment, and the student support.

There is perhaps sometimes a simplistic assumption that online learning saves money. The thinking seems to be along the lines that there's no need for printing or buildings; staff can be recruited from anywhere; the marginal costs of additional students are low; and the market is worldwide. Yet this assumption is very far from clear. Laurillard (2001) asserts, for example, that "In the short term, at least, costs increase." (p. 7).

D'Antoni (2003), in a UNESCO collection of eight case studies of universities depending heavily on ICT, identified a number of models that fail to take proper account of student demand, rapid technological change, student access to the technology, or the economics of production and presentation. The "UK e-University" enterprise is a recent example of a notable failure that may have its roots in false expectations about student demand.

The dangers of non-viable business models in online education have been recognised for some time now:

> "The proliferation of Internet education companies with dubious business models has resulted in an increasing reluctance to provide funding for early stage businesses. There has been a distinct increase in the number of calls each week from education businesses seeking to be acquired." (The Education Economy, August 2000)

The OU's national context has some similarities with the countries in which the C3D centres are based, but there are differences too. To put the OU's experience of online learning in context, it is worth pointing out some of the external drivers to which the University's 2004 "Learning and Teaching Strategy" refers:

- the growth of the knowledge economy and knowledge society and the consequent pressure to use HE to provide a skilled workforce to meet the needs of such a society, hence the increased interest of OU students in the vocational relevance of their courses;
- the globalisation of economic, political and educational activity, and consequent increased competition in the UK and worldwide (e.g. Universitas 21, Heriot-Watt's "Interactive University", Phoenix Online, University of Southern Queensland);
- the increasingly "consumer-like behaviour" of students, with expectations of online course delivery, just-in-time delivery, and personalised provision;
- demographic change, in particular an aging UK population;

- UK Government and European policies, such as student funding, widening and increasing participation, the Bologna drive for standardisation, and improving the accessibility of education to those with disabilities.

Although this represents a large part of the OU's context, there is evidence that similar drivers operate elsewhere. Hernes (2003), for example, identifies three overarching drivers on education: demographic change, globalisation, and the knowledge society.

Nevertheless, there are significant differences. The OU has been able to invest £30 million in e-learning over recent years, because it has been operating at scale. For example, recall that the course T171 (*You, Your Computer and the Net*) had over 10,000 students. However, this scale is a result of the OU's dominant position in the UK market, and most other providers have to develop business models that rely on a rather smaller student demand. This has implications for factors such as the number of hours a week tutors can be expected to contribute to online conferences; and the extent to which material is adapted from elsewhere or written from scratch. Alternatively, student fees have to be pitched higher. The OU's Masters degree in Online and Distance Education takes this approach.

For further information on the MA in Online and Distance Education, see http://www3.open.ac.uk/courses/bin/p12.dll?Q02F10_education

The OU's Learning and Teaching Strategy envisages that online technologies will expand global reach, diversify income sources, and increase cost-effectiveness. However, it also suggests that there might be a role for partnerships in the areas of materials production and online delivery, a suggestion which arguably indicates that online learning is not necessarily a cheap option. One of the distinctive characteristics of Open University study is the creation and delivery of extremely high quality learning materials, which take substantial person-years of academic and specialist production effort to create and deliver. Only the scale of delivery allows the OU to invest this much resource into learning materials creation. High-quality learning experiences need to be authored, designed and supported carefully to ensure that the student can understand and engage interactively with the materials.

However, there are other major costs. Without efficient working practices, online tutoring can lead to tutors spending excessive time in online conferences, adding to staffing costs. To ensure robust and reliable services, investment is also needed in the technical infrastructure, staff development, and a technical helpdesk.

Lessons from the eight UNESCO case studies emphasise the need for a stable, user-friendly, 24/7 system, with suitable user support, and planned updating of the technological infrastructure that takes account of rapid obsolescence. "Future-proofing" is sometimes seen as an obvious way to manage the risks of technological change, by monitoring the external environment and identifying which technologies are likely to be here to stay. Yet this is easier said that done. Meanwhile, the decision as to whether to buy or develop technologies is fraught with the potential of very expensive mistakes.

Along with most other online learning providers, the OU aims to make savings through high volumes: re-versioning content for different markets; licensing materials to and from other providers; reducing print, warehouse, postal and handling costs; reducing support staff costs through online materials and peer support; and automating administrative processes and market intelligence.

Catering for diverse student needs is, however, costly. The OU has found, for example, that making online components optional can increase staff workload significantly if this means have to produce a comprehensive course both for online students and for offline students. Internal estimates suggest that if 20% of a course is moved to ICT, with software developed from scratch, academic staff time can increase by 40%, production staff time can increase by 140% and presentation staff time can increase by 20%.

With regard to global reach, the OU's 2004 e-learning strategy notes that the use of print media in traditional distance learning leaves it largely dependent on postal systems which vary in efficiency from country to country, increasing costs and delaying delivery and return of materials and assignments. Recruiting and training suitable tutors to provide local support can also be problematic, as can the expense of contact through international telephone calls. The OU's typical model for presenting courses internationally has been to collaborate with a local partner and this has proved effective in versioning materials for local markets and culture. However, online learning, without precluding local partnerships where appropriate, provides a cost-effective opportunity to present course materials to students globally via the web. Nevertheless, this model requires access to an inexpensive, reliable internet connection, which is not an option in many areas of the world.

D'Antoni (2003) notes that when universities seek to expand their geographical enrolment reach, they face a fundamental tension between tailoring their courses to diverse needs (in terms of materials, language, cultural assumptions, institutional partnerships, governmental accreditation, and pedagogic strategy, for example) and gaining the economic benefits of standardising processes of course development, marketing and delivery. A particularly important issue in a regional context relates to perceptions of quality. Middlehurst & Campbell (2003) note that there has been strong distrust of less traditional forms of higher education in some parts of the world; and that reassurances about quality assurance processes founded on external peer review do not always stop the distrust.

While Cochrane (1999) perhaps goes too far in suggesting that "When a good master class is available online or on CD there will be little room for a second.", e-learning does offer the potential to carve out a niche.

SUMMARY

- A **sound business plan** is essential, taking realistic account of production costs, student demand, technological change, student access, reversioning potential, and social drivers such as the knowledge economy, globalisation, consumerism, demographics and governmental policies.
- **High-quality** course materials, tutoring and infrastructure do not come cheap.

Having underlined the importance of a sound business model and of a mix of technologies, we now examine how online learning can be considered not as a

completely new paradigm, disconnected from face-to-face teaching, and about which nothing is known, but rather as a feature of a number of trends in *distance* learning.

2.9 The importance of monitoring technological trends

In examining the practice of distance education, the OU's Learning and Teaching Strategy discerns the following large-scale shifts in Open and Distance Learning philosophy and practice:

> i) "from print-dominated courses to modern multi-media courses;
>
> ii) from materials-based learning to communications-based learning;
>
> iii) from complete materials delivery to greater exploitation of proprietary or publicly-accessible digital resources;
>
> iv) from whole course integration to course construction based on smaller modules, and in particular, on Learning Objects;
>
> v) from individual study to collaborative learning;
>
> vi) from uniform delivery to all students to more personalised provision."
>
> *(OU Learning and Teaching Strategy 2004-8, p. 14)*

These trends are made possible by innovations in information technology.

Distance education is commonly said (Nipper, 1989) to have moved through a number of generations. The first generation is largely print-based correspondence study. The second generation is that of Multimedia, in which print was integrated with broadcast TV and radio, video and audio cassettes, and later desktop software. The third generation is that of "TeleLearning", largely based on audio-conferencing and video-conferencing via telecommunications technologies.

Descriptions of proposed subsequent generations (Keegan, 1996; Taylor, 2003) might now be collectively referred to under the label "e-Learning". For example, Taylor describes the fourth generation as the Flexible Learning Model, largely using the internet to deliver courseware and to support asynchronous written communication (and sometimes audio-conferencing and video-conferencing).

Some might consider this model as part of the third generation, in that it simply makes more widespread two-way distance communication between tutors and students, albeit by internet technologies rather than other telecommunications technologies. Nevertheless, Taylor argues that the "reflective and precise nature" of asynchronous written communication is qualitatively different from the "spontaneous and less structured nature of oral discourse" (p. 24). It is this e-learning generation, now widespread in many industrialised countries, that has provided the many examples over the last ten years, of virtual universities and internet-based courses in traditionally face-to-face universities. This co-called fourth generation allows multi-media, multi-interactive, multi-modal and multi-collaborative learning to take place in the vast majority of homes in such countries.

Taylor (2001) also suggests that the fifth generation is currently emerging (the "Intelligent Flexible Learning Model"), in which institutional services are provided via the internet, and in which the products of asynchronous written communication are used as a basis for automated response systems. This, it is claimed, would allow a smaller staff-student ratio while maintaining a reasonable quality of tutorial support.

To this characterisation of the fifth generation, one might also add systematic uses of internet technologies to help teachers share and improve their pedagogical practices (Barab, MaKinster & Scheckler, 2003). According to Larson (2004), a key stumbling block to increasing HE participation rates in developing countries, aside from GDP, is the time needed to build faculties.

Web-based community tools for teachers hold out the promise of the pooling and improvement of both teaching materials and professional skills. Ultimately, these teaching materials would be stored in *Learning Object* repositories in a form that would facilitate ease of reuse.

Learning Objects are "bite size" self-contained chunks of content that, in theory, can be endlessly reused by being pulled together in different ways to create new courses quickly and cheaply. The concept is grounded in the object-oriented paradigm of computer science: components that can be reused in multiple contexts. Other purposes for Learning Objects include facilitating routine maintenance, personalisation and customisation, and modularisation of study. The "Learning Object approach" to course creation, then, is to favour the authoring of self-contained objects rather than integrated narrative arcs.

The Teaching and Learning Strategy quoted above referred to a trend from "whole course integration to course construction based on smaller modules, and in particular, on Learning Objects". However, a concern about Learning Objects has to be the implicit compromise between reuse and handcrafting. While the importance of avoiding reinvention of the wheel is not in doubt, the creation of a new course will often build on pre-existing materials in any case, except that there will be some refinement of these materials: to suit anticipated student needs; to suit the distinctive learning objectives and pedagogical strategies of the course; to suit the expertise and preferences of the course designers and tutors; to take account of recent developments in the topic; and to integrate and develop themes met throughout preceding material. So the judgment about whether reusing a extant Learning Object is preferable to creation of a course component from scratch depends on numerous subtle contextual factors; and it is therefore not at all clear, when course material is being written in the first place, how much account authors can really take of the potential for future reuse.

The fifth generation might also include ubiquitous mobile access to learning (freeing distance education from the fixed physical locations of hardware), and the routine expectation that students engage in discussions with tutors and peers not only via asynchronous text but also via synchronous video.

Whatever the number of generations distinguished, Bernard, Lou & Abrami (2003) suggest that these technological trends permit pedagogical trends "away from authoritarian and non-interactive courses towards those characterized by a high degree of learner control and two-way communication, as well as group-oriented processes and greater flexibility in learning."

The generations described here are summarised in Table 1.

Generation	Characteristic technologies
1. correspondence	print, post
2. multimedia	TV, radio, audiotape, videotape, CDs, DVDs
	simulation software, virtual laboratories, virtual fieldtrips
3. telelearning	audio/video conferencing systems
4. e-learning	webpage-based courses, document databases
	asynchronous text-based conferencing, email, internet chat
5. online multimedia	online multimedia Learning Object repositories
	online audio-conferencing, online video-conferencing
	online interactive software, online gameworlds, remote & virtual labs
	online administration, automated response systems, agent technologies, distributed course development, standardised course representations
6. mobile multimedia	mobile access to online multimedia

Table 1: Generations of distance education (based on Taylor, 2001, and others)

This framework of generations has several limitations. Firstly, institutions tend to combine technologies from different generations, and these combinations can vary from course to course. Secondly, (as will be seen later in this report) it neglects the fact that the same technology can be deployed in very different ways.

Thirdly (and most significantly in relation to the C3D project), it neglects the distinct technological realities of different countries, and the variation within countries, particularly in developing countries with a large rural-urban divide. So, for example, while some 9% of South African households have computers (ITU, 2003), it's headline 94% access rate to telephones (Statistics South Africa Census 2001, cited in ITU, 2003), disguises the fact that about 40% of people have access only through a public telephone rather than through a connection that could be used for the internet.

The International Telecommunication Union's "Digital Access Index" (DAI), which measures the overall ability of individuals in a country to access and use new ICTs, takes account of infrastructure, affordability, knowledge, quality and usage. South Africa and Sri Lank rank as "Middle Access" in the DAI (ITU, 2003). Senegal has one of the lowest access scores. By comparison, countries that are often cited in relation to "generations of distance education", such as the UK, the US and Australia have the luxury of "High Access".

Nevertheless, it is important to be aware of trends in distance education technologies, not just because the available technologies frame the practical constraints on course designers and the expectations of prospective "consumers" of the courses, but also because it can be tempting to select technologies on the basis of vogue rather than on the basis of what will promote most effective learning. We therefore now turn to the issue of what principles of learning appear to underpin current educational practices in online learning.

SUMMARY

- Distance learning has moved through several **generations**:
  - The First Generation was print-based correspondence study.
  - The Second Generation added TV, radio, cassettes, and CDs.
  - The Third Generation added telecommunications technologies.
  - Subsequent generations added internet technologies.
- Beware of making choices based simply on **vogue**.

2.10 Building on psychological research

The standard narrative about how the psychological study of learning has developed over the course of the 20th century is that it began with *behaviourism*, which focused on observable changes in behaviour as evidence for learning, and on the stimulus-response model as a learning mechanism. Behaviourism was then replaced by *cognitive psychology*, which allowed the possibility of conjecturing mental states, and emphasised the cognitive structures and memory processes that enable learning (*information processing theory*). Finally, as psychology took the 'social turn', cognitive psychology started to give way to *social psychology*, which emphasised the social, cultural and contextual nature of learning.

As with all historical narratives, this account of the psychological study of learning can be a helpful device for initially acquainting oneself with a complex interplay of ideas, people, events and literature; but it should not be accepted uncritically (Aczel, 2002). In particular, the narrative generalises across countries (with a US bias), and thus neglects the different social, political and cultural forces in different countries. Moreover, the narrative has a tendency to caricature, its chronology is questionable, and it leaves out traditions such as Gestalt theory, neuroscience, and personality research. A broader range of psychological concepts are available in Greg Kearsley's 'Theory into Practice Database' (http://tip.psychology.org).

To understand why the view of psychology as some sort of foundation to education is now seen as overstated, one has to appreciate that psychological studies over the past century have rarely had consequences for teaching that are simultaneously unequivocal, significant and directive.

Why this should be is far from clear, but there is a good case that research cannot hope to offer a productive examination of learning if it does not pay attention to students' prior knowledge, to the topic-specific problem situation, and to students' learning experiences.

New teachers can be both disappointed and relieved by the fact that psychology does not provide all the answers: disappointed that there is no simple road to learning that shortcuts their unremitting search for the best way to teach topic X to this year's students; and relieved that the skill of the teacher is an essential component in effective teaching.

Yet decisions still have to be made on the design of activities and assessments, on sequencing of material and choice of media, on how to tackle misconceptions and how to assist engagement and recall. Psychological studies can sometimes help with these decisions, by elucidating supposedly generic processes such as motivation, memory, reasoning and problem solving; by providing insight into conscious and unconscious mental and emotional states; and by illuminating cognitive development, personality, identity and group dynamics.

The literature in this area is vast, and so any account is bound to be idiosyncratic. Nevertheless, a number of concepts have been found to be quite productive over time.

For example, the issue of motivation is clearly important. What kinds of learning activities generate a positive emotional response? It is well-known that people tend to have different preferences for textual, graphical, and aural communication. Similarly, preferences tend to vary in the balances between individual and group activities; between activities that involve receiving information and engaging in practical tasks; between memorization and application; between game-like experiences and "serious" work; between assessment and practice; between analysis and synthesis; and between self-directed tasks and guided learning. Providing ways to achieve these balances for different students is a challenge.

For instance, the postgraduate course D833 (*Environmental Practice: Negotiating Policy in a Global Society*) mentioned in section 2.4 above used role-play to help motivate the study of UN environmental negotiations. In course feedback, many students strongly praised this aspect. An inexperienced tutor, however, might find it challenging to help the students appreciate the limitations of the simulation in relation to the real thing, and to help them appreciate the distinction between playing a role well and understanding the social science concepts and issues that the simulation aimed to motivate.

The carbon cycle and Galapagos examples in S103 (section 2.5 above) used attractive graphics and an intuitive interface to pose the relevant problems. Yet in a different topic area, without a careful thought, excessive use of graphics or overly simplistic interactions with the computer might detract from the concepts and issues.

Possible constraints on memory are also sometimes cited in course design discussions. For example, Miller (1956) suggested that there are limitations on the amount of information that we are able to receive, process, and remember; and in particular that short-term memory can only hold 5-9 chunks of information ("seven plus or minus two"). This bottleneck can be stretched, though, by means of "chunking". Sweller (1988) builds on this by suggesting that learning be designed to minimise students' "cognitive load".

Meanwhile, the notions of "learning styles" and "personality types" have recently been the subject of critical attention, because of the danger of pigeonholing students inappropriately. Even if students were neatly categorisable into groups (e.g. inductive versus deductive; concrete versus abstract; experimental versus reflective; activist versus reflector versus theorist versus pragmatist; introvert versus extrovert), few researchers would suggest that students do not vary within groups, or that students' categorisations are static across all contexts, regardless of instruction.

Yet recent research is also hinting that many people are prepared to disclose more about themselves online than they would do face-to-face.

SUMMARY

- The **psychological study of learning** can provide some insights, particularly in relation to topics such as motivation, memory, group dynamics, personality and identity; but "findings" should not be treated uncritically, especially if students' prior knowledge and the specifics of the topic are ignored.

2.11 Trends in pedagogic practice

> "… it is essential to recognize that existing course content cannot be shovelled into technology supported courses. New pedagogical models are needed, and the challenge is to improve the process of interaction and knowledge construction. The [teaching and learning] model also needs to accommodate different types of learners. As the demand for higher education throughout life increases, institutions face an increasingly diversified student profile." (D'Antoni, 2003, p. 5).

In studying trends in pedagogic practice, it is sometimes difficult to distinguish significant change from transient effects. However Mason (2003) argues that the following trends are clear:

1. **More active learning**: Learners have to be more active in determining what and how they learn, to take more responsibility for their learning. Learning is happening through sharing and adapting knowledge rather than passive acceptance. The focus in online learning is moving from transmission of content to peer discussion and collaborative activities.
2. **Faster, more flexible learning**: As the pressures of time increase, knowledge production is speeding up. Learning at work and in informal settings is becoming as important as learning in classrooms. "Lifelong learners will inevitably be fitting their learning in and around many other demands on their time." (Mason, 2003, p. 7), leading to short, modularised, personalisable courses. "The learners can choose the time, the place and the pace of their learning" (p. 10).
3. **More sophisticated information handling**: As a consequence of greater information availability, being able to locate, evaluate, analyse, synthesise and apply information is more important than memorisation.

These trends appear to have much in common with pedagogies that are sometimes called "student-centred", "participatory", "democratic", or "discovery learning". These pedagogies emphasise activity, the centrality of the learner in the educative process, and a constructivist or social constructivist learning theory (see 2.13 below). Students are viewed as active participants in the learning process rather than passive recipients of factual knowledge from an authority.

Student-centred pedagogy is sometimes portrayed as entailing the *empowerment* of the learner.

Firstly, active learning is intended to place an additional responsibility on the teacher to help the student become a more independent, self-regulating learner, partially liberated from some of the constraints traditional placed on educational processes by

the teacher. By cultivating the student's independent learning skills, the teacher is said to be empowering the learner to learn for himself or herself.

Secondly, empowerment is also said to come from the move to faster, more flexible learning, particularly online learning, in which students can be given more choices about the time, place and pace of learning.

Thirdly, the inculcation of sophisticated information handling skills, and the ready available of online information, means that students are no longer so dependent on the authority of the teacher to impart information and to validate knowledge. Rather, multiple sources can be pursued and compared. Again, the learners are said to be empowered.

However, we wish to raise some questions about whether these trends in pedagogic practice are necessarily as inevitable and empowering as sometimes portrayed.

Although Mason argues that "It is surely not a coincidence that the movement towards a student-centred pedagogy has gathered force just as the technologies to support such a move have taken hold." (p. 14), one can question whether the observed trends towards more active, rapid, and informal learning and an emphasis on handling information are a necessary consequence of current technologies; or simply a facet of educational fashion. The teacher is never the "sole determiner of the student experience" in face-to-face teaching; and, conversely, there is plenty of scope for teachers to be more assertive about what online students are expected to do.

The greater flexibility afforded by online learning is unlikely to be an inexorable trend, and the fact that it is remarked upon is arguably symptomatic of the newness of the phenomenon. Part of the fascination might be explained by the fact that text-based conferencing readily suggests peer collaboration as an explicit part of the learning model, if peer discussion and collaboration has until now been underexploited. As educational practices and expectations gradually evolve, one can expect peer learning soon to become simply part of the educational toolkit, and thus cease to be a cause of wonder. Moreover, that students have become "consumers", demanding that courses fit their lifestyles rather than vice-versa, does not preclude the possibility that students might demand more "teacher-centred education" if this paradigm were to become seen by them as more educationally effective for them than student-centred learning.

The developing-country perspective is also very relevant here. For example, it is not at all certain yet that countries with fewer resources can achieve access to the same wealth of materials as other countries. Aside from the obvious telecommunications and ICT gaps, subscriptions to high-quality databases are expensive and do not necessarily take account of GDP.

In developed countries such as the UK, some conservative commentators ascribe the putative decline in respect that students hold for their teachers (and for authority in general) to the growth of the student-centred pedagogy. Developing countries with a strong tradition of respect for the authority of the teacher have no wish to import such trends, even in the name of "empowerment".

Furthermore, those developing countries that have chosen to tackle historical imbalances in power and wealth by embarking on national policies of high centralisation may find it difficult to reconcile these policies with the potential libertarian tendencies that some claim are inherent in student-centred learning. For example, Tabulawa (2003) argues that "learner-centred pedagogy is a political artefact, an ideology, a world-view about how society should be organised. … it is

inherently ideological" (p. 10); and its proponents see this pedagogy's efficacy as "lying in its ability to promote values associated with liberal democracy", by helping to break authoritarian structures in schools and ultimately in society as a whole. In particular, Tabulawa claims that "the interest of aid agencies in the pedagogy is part of a wider design on the part of aid institutions to facilitate the penetration of capitalist ideology in periphery states, this being done under the guise of democratisation." (*ibid.*)

Tabulawa goes on: "Given that there is no compelling empirical research evidence that there is a positive (and causal) relationship between the pedagogy and students' cognitive learning, couching its efficacy in cognitive/educational terms at best appears as an attempt to disguise its ideological mission." (p. 22)

Mason concedes that "Those who have poor study habits, lack self-discipline or motivation, have been educationally disadvantaged, or are driven almost solely by extrinsic reasons for wanting a degree, tend to find the student-centred pedagogy bewildering, too demanding or too much hard work." (p. 15).

We do not wish to argue that student-centred learning is bad. Indeed, many in the OU are strong advocates. We merely want to point out that "empowerment of the learner" is not unproblematic in many cultures. In relation to online learning, we have pointed out the view that online learning is more neutral as to the autonomy of the student than has sometimes been suggested. The arguments presented here do not contradict assertions that asynchronous conferencing has encouraged peer-to-peer interaction, a focus on text rather than personality, and reflection rather than assimilation of facts.

SUMMARY

- **Trends in pedagogic practice** are towards
    - more active learning, particularly involving discussion and collaboration;
    - faster, more flexible learning, particularly at work;
    - skills in evaluating and applying knowledge, rather than rote learning.

  However these trends are neither inexorable nor culturally neutral; nor does educational fashion necessarily ordain a pedagogical approach that is suitable for all students, for all educational aims and for all business models.

This report has now considered the major constraints and trends relevant to course construction: financial, social, pedagogic, and technological. We have seen advantages and disadvantages claimed for online learning. We now briefly examine the evidence, and some fundamental criticisms of online learning.

2.12 Understanding the limitations of online education

Big claims are often made about the pedagogical value of learning online. For example, Mason suggests that "There is much research evidence that online education

produces the same or better results in terms of marks as traditional courses, and there is anecdotal evidence that students engage in more interaction in online courses than in campus courses." (p. 8). She particularly emphasises its value for lifelong learners and minority learners; and indicates that internet-based communities of learners and teachers "rival face-to-face groups in their intimacy, support and learning outcomes" (p. 5). The "increased engagement of students with the learning process can reduce drop-out and improve satisfaction ratings." (p. 15). See, for example, the example of the Korea National Open University (cited in Jung & Rha, 2001).

However, direct comparison between online and traditional courses is methodologically challenging. The courses that have been chosen for online delivery have been selected because they are seen as being particularly suitable for online delivery. Evidence of successful courses is trumpeted for marketing reasons; courses that produce less triumphant evidence of financial and academic success are quietly dropped. Meanwhile, the students who chose to study online tend to be those who are comfortable with studying online, and are not necessarily representative of the whole population (Beyth-Marom et al, 2003).

Laurillard (1994) concludes that many evaluations of new educational technologies – this is prior to the widespread use of the web for teaching – tend to have fairly predictable findings: the students were enthusiastic and the technology demonstrated potential, yet there were logistical problems and the technology showed no significant improvement in learning outcomes over other teaching methods; the technology was more successful when management was supportive, and more valued when its use received credit.

Arguably, evidence from evaluations of online courses does not look, in 2004, so very different from this. So online delivery of learning should not be seen as a panacea.

In particular, there are disadvantages to relying on entirely online presentation components. For example, people tend to prefer reading text on paper than reading text on screen; database subscriptions can be expensive; the choice of hand-selected links needs to be reviewed regularly; and it can be tempting to provide a great deal of material for students without proper attention to the question of workload.

In addition, feedback components are typically expensive to develop and they can be ineffective if the feedback is inappropriate. So, for example, the questions asked and responses given to answers can be pitched at too high a level, or too low a level, or can just confuse. Meanwhile, as was suggested earlier, virtual fieldwork does not usually provide experience of the messiness, hands-on techniques, or fortuitous opportunities of physical fieldwork.

Moreover, the pedagogical disadvantages of using online text-based communication components (at least in the 4th generation) compared with face-to-face discussions are sometimes overlooked: the slower pace of text-based interactions; the lack of body language in supporting engagement; the need for much more reading; and the gambles tutors and students have to make associated with having to be more selective about what to read.

A common criticism of online learning is that it lacks the tone of voice, facial expression, gestures and postures that make face-to-face communication a very different kind of experience to written communication. The evolution of "emoticons", asterisks for emphasis, and "netiquette" are attempts to help address this problem.

Nevertheless, in an international and multi-lingual context, non-verbal cues would perhaps be particularly missed.

A profound problem is raised by Dreyfus (2001), who has emphasised the importance of emotional involvement in learning, of taking the risk of proposing and defending an idea in front of others to see 'whether it fails or flies', of participating in a class 'before which the student can shine and also risk making a fool of himself' (p. 169). Online, 'the professor's approving or disapproving response might carry some emotional weight, but it would be much less intimidating to offer a comment and get a reaction from the professor if one had never met the professor and was not in her presence' (p. 169). Dreyfus argues that it is precisely the risks of high-value emotional consequences of commitments that enable students to progress beyond mere competence in a subject to proficiency or expertise.

This suggests that those who design online courses should consider ways to oblige learners to commit to learning in a comparable way to Dreyfus' ideal, perhaps through the formal submission of some kind of personal contribution, such as an essay or an oral report.

Laurillard (1993) argues that when ICT is used to diminish teacher-student contact, students' conceptions of knowledge may be neglected because…

> Part of the great value of the tradition of teacher-student contact is that, in the interstices between content-related talk, the academic can stand back from the task in hand and encourage the student to look at the nature of the academic enterprise itself. It will probably be in such a discussion that the student is treated to the sudden revelation that getting the right answer may not always be the most important goal. (pp. 202–3 in the 2nd edition)

Students might also miss the opportunity to discover the lecturer's personal commitment to the subject, which may make it more difficult to develop and nurture their own commitments to the subject.

According to Blake (2000), online tuition is typically taken to be second best to face-to-face teaching. There is a suspicion that ICT is 'socially isolating and diminishes the quality of communication between tutors and students' (p. 183). Blake asks what precisely it is about the nature of face-to-face interactions that establishes that they are educationally superior. 'On the one hand, the possibilities for vocal intonation, facial expression and body language certainly enhance the communicative repertoire of both teachers and students. On the other hand, there is a presumption in favour of rapid feedback which seemingly places distance teaching at a poor second best' (p. 185). However, he suggests that the kinds of communication involved specifically in 'rubbing along together' and 'oiling the wheels' can be seen, in some ways, as inappropriate in teaching interactions. 'If teaching in higher education is to aim at strengthening students' grasp of objective aspects of intellectual disciplines, then the personal, the subjective and the individual have to be somehow bracketed off and kept in their place, on both sides of the teaching interaction.' (p. 188). Consequently, although such kinds of communication can help 'etch some lesson in the student mind', they are 'generally understood to be breaches, perhaps minor but sometimes perhaps not so minor, of good academic practice' (p. 188). Clearly there is a tension between this conclusion and Laurillard's earlier suggestion that lecturers should demonstrate their personal commitments to the subject. However, Blake is not saying that the personal is irrelevant to teaching, but that online tuition makes it easier for both sides to 'construct a relationship appropriate to their shared academic context and endeavour.' (p. 195). Online tuition enables participants to exert more control

over what aspects of their identity they choose to share, and so help avoid prejudices and fears of prejudices that might otherwise weaken the educational value of tutorials.

This view is supported by a survey of US college students (Jones, 2002), over half of whom said that email had enhanced their relationship with their professors (compared with 2 per cent who said that email has had a negative effect), and in particular that email enables them to discuss assignments and to express ideas that they would not have expressed in class.

However, the same survey of US college students found that only 6 per cent of students at traditional colleges took online courses; and of those, only half said they believed it was worth their time: the same proportion said they learned less from the online course than they would have from an on-campus. Online courses are not apparently living up to the hype.

As with other innovations, online education is not automatically *better* education. Any advantages relating to the quality of the learning experience, economics or convenience have to be established anew when key aspects of the educational aims or business model change.

SUMMARY

- **Students vary** in their valuing of online learning. Logistical problems typically cause high irritation. There is no definitive evidence than online learning is superior to other methods.
- **Feedback components** are typically expensive to develop and they can be ineffective if the feedback is inappropriate.
- When it comes to reading text, **students tend to prefer paper to screen**. It is also **easy to overload students** with work.
- **Text-based discussions** lack body language, tone of voice and (arguably) emotional weight. They also require a slower pace, more reading, and greater selectivity in what to read.

Having considered major constraints and trends relevant to course construction, we return to the questions posed in section 2.2: For a given course, how should one choose the mix of technologies? What should be the balance between private study and discussion? How should one write the materials? How should one structure the tuition? There are no definitive answers to these questions, but a great deal of relevant research and thought. We start by looking at the psychological study of learning, before going on to examine learning models and proposed pedagogical approaches.

2.13 Awareness of different learning theories

Partly overlapping with the psychological study of learning is the realm of *learning theories*. Multi-disciplinary and driven by educational concerns rather than psychological questions and methods, the twentieth-century “grand narrative” for

educational research into learning tends to follow a similar trajectory as that of the psychological study of learning. Skinnerian *behaviourism*, which emphasised the role of conditioning, gave way to *constructivism* under the influence of Piaget (e.g. 1929), Bruner (e.g. 1960) and others, and so the focus became the learner's active role in constructing knowledge based on his or her own experience; and then *social constructivism* followed, emphasising the role of context, groups, culture and communities.

As with the psychological grand narrative, this account is a little simplistic, but can serve as an introduction.

Behaviourism

Behaviourism is distinctly out of educational fashion in many countries; however Gagné et al (1992) bring together a number of notions relating to "conditions of learning" into a framework that is fundamentally based on the behaviourist notions of stimulus and response. The influence of this work tends to be generally greater in the US than in the UK.

Constructivism

The impetus for constructivism came largely from the study of young children, and from the passion of writers such as Dewey (1916), Rogers (1969), Papert (1980) and Kolb (1984) for active learning that makes the most of young people's natural curiosity and emphasises their building on meaningful, authentic experiences through reflection. In essence it is the view that students construct their own knowledge, and that the role of the teacher is not one of authoritative *transmitter* of knowledge but as *facilitator* of knowledge construction. This change in role has often been dubbed as being the "guide on the side" instead of the "sage on the stage".

Constructivism has tended to come rather later to Higher Education, although Knowles (1984) developed a theory of "andragogy", a kind of constructivism for adult learners, some time ago. This emphasizes that adults expect to take responsibility for their own learning, that they need to know *why* they need to learn something, and that they learn on the basis of experience, particularly working through problems.

From a practitioner's perspective, constructivism has been criticised for misleading students into thinking that there are *never* right or wrong answers, for being an inefficient way of teaching, for emasculating the teacher, and for undermining the student's confidence by demanding that the teacher refrains from acknowledging right answers. However, constructivism is a view of learning, not a theory of teaching, and so can be operationalised in a variety of ways. These criticisms are arguably of simplistic applications to practice.

Nevertheless, it does appear that, at least in the initial stages of a new topic, constructivist approaches can take longer than transmission-based approaches, because students need to engage in activities or discussions that enable them to refine their understandings. As Weller (2002) puts it, "They may have to pass through several phases of understanding of concepts before they arrive at the ones that could have been imparted in a text or lecture from the outset." (p. 76). It is hoped that their understandings are deeper, and more memorable, whereas transmission-based approaches need to spend more time later adding to the understanding and reinforcing the memories. However the empirical evidence in this regard is not unequivocal.

Social constructivism

From a theoretical perspective, constructivism has been criticised for supposedly limiting its focus to internal cognitive structures, to natural human development, and to the lone problem-solver. This has motivated ethnographic exploration of the social and contextual factors associated with learning, rather than simply the effect of teaching on the individual.

For example, the work of Vygotsky (e.g. 1962, 1978) has been used to argue for a more socially-situated view of learning, and has contributed to the analytical framework called Activity Theory and to the movement known as "social constructivism". Learning is seen not an individual activity but as social participation, in which language, shared tools and communities play crucial roles. Brown, Collins & Duguid (1989) and Lave & Wenger (1991), for example, are often cited in connection with "situated learning" and "communities of practice".

We note in passing an interesting strand of research that examines the range of practices with which students have to come to terms, including practices relating to interactions with the teacher, the institution, the discipline, and with peers. In online learning, many of the usual cues relevant to power relations are seemingly absent, such as dress, accent, body language and the physical environment. Yet other cues, primarily those of language and cultural assumption, are present; and perhaps therefore emphasised. There can also be clashes of expectations between course designers and students with respect to workload, learning style, and assessment.

Applications of constructivism and social constructivism to pedagogical practice are examined in section 2.15.

Concepts from other learning theories

Many of the various learning theories can be roughly characterised as elaborations of these broad paradigms of behaviourism, constructivism or social constructivism. However, it is worth pointing to some interesting outliers.

Affordances: The notion of "affordances", put forward by Gibson (1977), is much used in the study of computer interfaces. The idea is that aspects of the environment (affordances) provide cues necessary for perception. So, for example, a computer mouse affords movement of a pointer on a screen. The string of words displayed horizontally on top of the computer screen cue menus that allow actions to be selected. A company logo at the top left of a web page tends to be seen not just as branding but as a means to return to the website's homepage.

Studying such affordances can improve the efficiency with which desired behaviours are learned; but more intriguingly, much learning itself can be thought of as acquiring the ability to identify affordances in a given environment.

Conversation theory: Laurillard (1993), following Pask (1975), portrays academic learning as coming to know descriptions of the world through a discursive interaction between teacher and student, involving reflection on experience.

The learning process therefore consists in four processes: *discursive* (the student and teacher iteratively refine conceptions); *adaptive* (the teacher adapts the student's interaction with the world to enable him/her to experience it from the teacher's perspective); *interactive* (the student interacts with the world in a way that enhances his/her experience); and *reflective* (the student reflects upon his/her experience and its

relation to the teacher's description and thereby adapts his/her own conception). Laurillard also attempts to distinguish media types on the basis of their role in such conversations.

Orientations to knowledge: Perry (1970) investigated how Harvard undergraduates' orientations to knowledge changed during their courses. Many started with a naïve view that knowledge in a new domain simply consists of certain facts, and so the task of the student would be to learn these facts by reading or hearing the words of experts. Perry (and subsequent researchers) outlined an intellectual progression from this view to more sophisticated positions, such as acceptance of diverse opinions as legitimate; awareness that it is possible to make principled commitments; or recognition that there are different standards by which knowledge is warranted in different contexts and cultures.

Some researchers have suggested that epistemological sophistication is correlated with academic performance, but it is not clear that epistemological beliefs are discipline-independent (Hofer, 2000). Moreover, naïve realism might sometimes be more academically productive than nonchalant relativism (Elby & Hammer, 2001). Finally, an awareness that some ideas are more speculative than others does not imply a complete grasp of *which* ideas or *why*.

Serialists versus holists: Pask also distinguished between two types of learners. When engaging in an unfamiliar topic, "serialists" work step by step, building from the known to the unknown with the simplest possible connections between the items of knowledge. "Holists", on the other hand, look for a higher order relation – "the big picture" – and then explore it until they have filled in the whole.

Deep versus surface learning: Marton & Säljö (1976a, 1976b) and others identified two distinct approaches to learning. A "deep approach" is one in which the student tries to develop a personal understanding of the topic by critical engagement with the ideas and arguments, by identifying structural relations between the ideas, by relating the ideas to previous knowledge and experience, and by memorising significant aspects of the ideas. A "surface approach" to learning, in contrast, is one in which the student concentrates only on what is needed to pass the assessment, accepting information passively and relying on memorisation of facts and procedures without considering underlying principles.

Many studies since then have confirmed that students who adopt a deep approach tend to achieve better learning outcomes. Some educators have taken these approaches to learning as derived from students' conceptions of learning – whether the students see learning as a chore or a joy. However, it is important to note that deep and surface approaches are not fixed personality traits – a given student can adopt either a deep or a surface approach to different tasks (or even move between approaches within the same task). In fact, the ability to optimise learning outcomes through efficient study methods, taking into account pragmatic considerations of time and capability has sometimes been called a 'strategic' or 'achieving' approach.

SUMMARY

- **Learning theories** can be useful in conceptualising course design decisions:
  - **Behaviourism** emphasises skills, conditioned learning and memory.
  - **Constructivism** emphasises the learner's active role in constructing knowledge by reflection on experience.
  - **Social constructivism** emphasises context, culture and communities.

2.14 Linking learning theories and online learning

Conole et al (2004) suggest that it is possible to make links between such learning theories and e-learning applications. For example, they imply that constructivism might be realised in an e-learning context using toolkits, access to resources and expertise, microworlds and simulations; socially-situated learning might be facilitated by the use of multiple forms of synchronous and asynchronous communication, and of archive materials.

However, it would be implausible to assert that one can simply examine the choice of different ICT applications to determine an underlying learning model. Resource databases, for example, simultaneously lend themselves to tasks based on principles of feedback, problem-solving, discovery, shared artefacts, and reflection; that is, from a variety of learning models.

Nor is it usually possible simply to "read off", from a course team's particular ICT choices, the type of student learning that occurs in practice; much can depend on the design of particular activities, on the students' prior knowledge, on the personality of the tutor, of the mix of peers, and so on.

Moreover, students have different learning preferences, and these preferences may vary between types of learning objectives (practical skills, theoretical understanding, fact memorisation, and so on). So a rich learning experience should present, where feasible, multiple and redundant opportunities to cater for a variety of preferences.

What is needed, then, is way of mapping the planned activities in which students are to engage with the learning theories. Conole et al propose a framework for comparing the key components of these learning theories that might serve this purpose. One way to represent the framework is by means of three dimensions:

- *Individual versus social*: the extent to which the individual is the focus of learning, or to which learning is explained through interaction with other people and the wider social context.
- *Reflection versus non-reflection*: the extent to which learning arises through conscious reflection on experience or through processes such as conditioning and memorisation.
- *Information versus experience*: the extent to which the basis of learning is text, artefacts and bodies of knowledge on the one hand, or direct experience, activity and practical application on the other.

These components are put in opposition to each other here for ease of explanation, but of course individual learning theories would combine aspects of the components in different ways. Moreover, Conole et al warn that such models are "best understood as sharable representations of beliefs and of practice, rather than as definitive account of the area" (p. 18). They also make clear that this framework is not intended to capture the full richness of each of the learning theories; and indeed the distinctions the components imply between the learning theories are crude. The framework is not derived from extensive theoretical argumentation or empirical work, and is untested.

There are additional reasons to be cautious about the application of the framework. For example, positioning a given activity along the dimensions can be a somewhat subjective decision, except in trivial examples. Moreover, Conole et al warn that the framework might need to be interpreted differently in different disciplines. Nevertheless, the framework can serve as a rough-and-ready means by which learning activities could be compared for their pedagogic role.

In applying the framework of Conole et al to online learning, then, it could be argued that restricting learning only to one end of each of these dimensions needs justification. For example, if an online course consists only of a set of webpages, it allows on the "individual versus social" dimension opportunities for private learning, but no opportunities for group communication or collaboration. On the "conditioning versus reflection" dimension, these webpages might encourage reflection and practical activities, or they might not, depending on how they are written.

Another example would be the use of asynchronous text-based conferences. On the "individual versus social" dimension, these conferences naturally allow group communication and collaboration, but can create tensions for students who want to be independent learners. Opportunities for private learning might have to be explicitly encouraged by the tutor. On the "information versus experience" dimension, conferences might be used simply to relay information, or they might be used for practical activities (debate, scrutiny of archives, analysis of research data) or for foster discussion in which participants reflect on their previous experience.

Should such conferencing be optional or compulsory parts of a course? If it is optional, it might be used effectively by just those who want to engage in discussion; but it might be ineffective for everyone if there are insufficient contributions to sustain serious discussion. If it is compulsory, how are contributions to be assessed? Will it lead to posting simply for the sake of posting? The framework of Conole et al, as with many learning theories, does not provide answers to such dilemmas, but might help to structure judgments.

The notion of "transactional distance" (e.g. Moore, 1993) might be useful here. This notion, drawing on systems theory, is based on three key variables:

- *structure* – the rigidity of the design of a course with respect to the learner's individual needs, the learning objectives and the teaching strategies
- *dialogue* - the extent to which learners and teachers are able to communicate with each other
- *autonomy* – the self-directedness of the learner

These variables interact. So, for example, a highly structured technology would be likely to allow little dialogue; achieving high levels of autonomy would mean less structure

"Transactional distance" is intended to be a measure of psychological distance between participants in the teaching-learning situation; and Moore hypothesises that it is a function of structure, dialogue and autonomy. An instructional situation is considered more distant if there is higher structure, lower dialogue, and lower autonomy. A textbook would be considered to have a high transactional distance. An audio conference would be lower.

It is also perhaps worth pointing to the long-established distinction between "differentiation by outcome" and "differentiation by task". The first focuses on how students respond differently to the same teaching approach; the second on how varying aspects of the "task" (which, here, might include the materials, the technology, and the assignments) can better help different kinds of students.

So, returning to the question of whether or not asynchronous text-based conferencing should be optional, knowledge about the target student group has to be brought to bear on the question, in particular knowledge about their self-directedness and their preferences for dialogue.

SUMMARY

- A number of **learning dimensions** can help refine the pedagogy of a course:
  - **Individual versus social**: a balance of opportunities for private learning and for group communication and collaboration.
  - **Conditioning versus reflection**: a balance of opportunities for conditioning processes and for reflection on experience.
  - **Information versus experience**: a balance of opportunities for receiving information and for practical activities.
  - **Structure versus autonomy**: a balance of opportunities for expert guidance and for self-directedness.
  - **Generic versus personalised**: a balance of opportunities for differentiation by outcome and by task.

2.15 Some pedagogical approaches

We have looked at trends in pedagogic practice (towards encouragement of more active, flexible learning, for example), insights from psychological research (relating to memory and motivation, for example), and concepts in educational theory (including constructivism and deep versus surface learning). These trends, insights and concepts hint at possible principles for constructing online courses; but there are also more defined approaches to course construction.

Weller (2002) identifies a number of pedagogical approaches that seem to lend themselves to online learning:

- resource-based learning (RBL)

- collaborative learning
- problem-based learning (PBL)
- narrative-based learning
- communities of practice, cognitive apprenticeships and situated learning

We consider the potential advantages and disadvantages of each of these pedagogical approaches.

Resource-based learning

Resource-based learning (RBL) is a pedagogical approach that encourages students to explore and exploit a variety of data sources, rather than simply using those crafted specially by the course designer. So, typically, the teacher will set a task for individual or groups to solve a problem, develop an artefact or argue a case, and will point them in the direction of data sources that might help. Clearly the ready availability of the web, databases and journals makes this approach a practical option.

So, for example, the third-level course U316 (*The Environmental Web*) teach students how to navigate through the morass of environmental material available on the World Wide Web and how to analyse information, determine where uncertainties lie and evaluate different approaches to environmental issues. See an example of RBL at the demo for U316 at www.open.ac.uk/science/env-web/activities/actv_01.htm

The course culminates in students researching an environmental topic of their own choosing, using the resources of the Web, and then presenting their findings to others through web pages.

Among the perceived advantages of resource-based learning for students are that it encourages students to be inquisitive, active "foragers" rather than passive "consumers"; to engage with a multiplicity of viewpoints rather than a single belief system, thus broadening their education; and to develop skills for weighing up the quality of the arguments offered by different sources, rather than relying on the authority of the teacher to provide guarantees of quality. These advantages are said to empower learners, along the lines discussed in 2.11 above.

From the course developer perspective, an attraction of resource-based learning is its potential to lessen the burden of keeping course materials up-to-date, because external sources can be used for the bulk of the materials, and there is much less fine-tuning of these materials than in conventional courses.

As we have seen, online technologies can make it easier to personalise distance teaching, and therefore contribute to "differentiation by task" (see previous section). Resource-based learning can make differentiation by outcome more effective, by enabling students to find resources that best suit their own particular learning preferences and needs.

The role of the teacher in RBL is to help the students to understand and refine the task, to keep them focused on the task, and to provide feedback on their progress.

There are a number of potential disadvantages of RBL:

- Tasks have to be carefully designed to enable students to have a good chance of achieving the learning outcomes; it is easy for tasks to encourage students to head in directions that do not help them develop relevant understandings.

- Foraging rather than completing the task can become an end in itself.
- The range of available data sources is likely to be skewed or narrow in some way, and some guidance or supplementary materials might have to be provided to address this.
- Evaluating the quality of data sources is often non-trivial.
- It can be more time-consuming for the student to forage rather than to access pre-prepared materials.
- Students can feel short-changed in that they often expect the course to provide the materials rather than requiring them to seek out their own resources.

Resource-based learning can often be combined with other pedagogical approaches, to minimise the effects of these perceived disadvantages.

Collaborative learning

In collaborative learning, small groups of students are given tasks that require them to work as a team. For example, they might research a topic together, dividing up aspects of the topic amongst each other, and then plan a presentation and discussion (akin to a virtual seminar) for the rest of the cohort. Or they might engage in role-play. Or they might be asked to produce jointly an essay, website, composition, or program.

> "Evaluation studies have shown that online collaboration, where students can work together either in small groups or in large conferences, can considerably enhance the learning experience. Students value the collaborative learning it offers, especially in the early stages of a course." (Laurillard, 2001, p. 4)

From a learning theory perspective, collaborative learning derives from social constructivism (see above), and the view that learning is inherently social. Collaboration is said to promote active learning, communication skills, and exposure to multiple viewpoints. Explaining one's views to others effectively and understanding others' views can lead to deeper understandings.

More than this, proponents point to Vygotsky's "Zone of Proximal Development" – the scope of what a learner can achieve with the help of others, beyond what they can achieve alone – as justification. Examples are sometimes given of surgery, football or running a ship, in which a task is so complex that a group has to work together as a unit, and processes are distributed across the team so that communication protocols become finely tuned. The task is impossible for an individual to achieve alone, and the outcome of the teamwork is greater than the sum of the parts played by each member. This phenomenon is described as "distributed cognition". Rather than seeing knowledge as an abstract body of propositions transmitted in the most effective way possible, collaborative learning recognises that knowledge is framed by the perspectives, existing understandings and social relationships of individuals and communities. So each student brings their own skills and understandings to the task, the work can be distributed, and the group can thus achieve more than could have been done individually in the time.

Criticisms of collaborative learning include:

- It can over-emphasise the social at the expense of the individual: many students say that for certain topics they need private study time to contribute fully to a group. Students can find it difficult to find the time to engage in

sustained individual reading and reflection when the assumption is that all work is collaborative and that withdrawing from a group, albeit temporarily, is seen as "anti-social". As Laurillard points out, they can then feel guilt and stress about letting their colleagues down. Moreover, the timetable constraints of sustained participation in group activities necessarily mean that students lose some of the flexibility in planning their study that might have attracted them to online learning in the first place.

- A student can find himself or herself in a group that, for whatever reason, becomes fractious and unproductive. The student's success in the course can thus be adversely affected by group dynamics that might be outside their control, and this can lead to frustration and low levels of satisfaction.
- Collaborative learning has sometimes been observed to lead to activity without reflection; and conversely, reflection without activity.
- In some topics it can be difficult to devise tasks in which collaboration with others enables students to engage actively in the relevant ideas.

Nevertheless, Weller (2002) writes:

> "Although difficult, possibly time consuming and occasionally frustrating, collaborative learning offers a number of benefits that make it an almost essential part of any online course which sets out to use the technology in a meaningful way. However, my personal feeling is that it should be implemented with caution. The requirement for students to work collaboratively does run counter to the flexibility offered by distance study, since students are tied to the specific timing of activities. If students find themselves involved in a different group task every week, it can be tiring and frustrating. Thus providing a combination of collaborative activities appropriately spaced throughout the course with individual activities can provide the benefits of both approaches." (p. 82)

Alternatively, Laurillard (2001) suggests that an effective strategy is "to offer collaborative learning as a support at the beginning of the course and then reduce it towards the end, as students become more independent, and need more control of their own schedules." (p. 4).

Developing a sense of community online and fostering productive collaborative skills can be challenging for tutors. In running staff development activities at the OU, it has been observed by some that online collaborative work tends to work best when group participants have met each other face-to-face before collaborating online. However this is not always possible. The OU's Master in Online and Distance Education strongly emphasises course community, with many opportunities for collaboration; but this has meant that the numbers of students per tutor has to be kept low.

Problem-based learning

Problem-based learning (PBL) is a pedagogical approach that starts with problems rather than with the presentation of information. Problems – often authentic, real-world problems – are introduced in such a way as to engage students' curiosity. The students are then required to find the information and develop the skills they need to solve the problem. In some versions, students even help to formulate the problems in the first place.

Justifications for problem-based learning can be traced back to a number of thinkers. The Gestalt psychologist Max Wertheimer, for example, made an interesting distinction between "reproductive thinking" and "productive thinking" (Wertheimer,

1943). *Reproductive* thinking is essentially reasoning that makes use of recall and association, and is attended to in education by memorisation and regurgitation of facts and procedures. *Productive* thinking, on the other hand, is insight-based reasoning, starting from problems. It might involve seeing a problem in a completely different way, or solving a problem by attending to wholes rather than parts. Meanwhile, the philosopher of science Karl Popper (e.g. Popper, 1934) famously asserted that "all life is problem-solving", and suggested that scientific discovery starts with the pursuit of problems rather than with the accumulation of facts.

The idea of problem-based learning is to start with the problems of a course rather than the content, and so challenge students to "learn to learn". It can be combined with collaborative learning and resource-based learning so that students have to work cooperatively in groups to seek solutions using the available resources. But PBL can also be applicable when students are operating as individuals rather than in groups. Courses can consist of a sequence of problems, or a large problem that students are helped to break-down into smaller problems.

Proponents argue that problem-based learning increases motivation, because learning always has a purpose: students are clear about the reasons for engaging with abstract ideas, rather than feeling that they are being force-fed information that someone else thinks is important for them to learn. As with resource-based learning and collaborative learning, students are forced to be active rather than passive. Students are given greater responsibility for their own learning, and can usually adapt their problem solving to suit their own particular interests. It is also argued that PBL prepares students to think critically, to analyse, to develop general problem solving skills, and to engage sensibly in realistic problems.

Criticisms of problem-based learning include:

- The problems cannot be as "authentic" or as open to negotiation as sometimes claimed, because there are learning outcomes that must be achieved, assessments to pass, and some problems do not lend themselves to intermediate solutions.
- Students can feel lost without there being "things to learn", and uncertain about how to proceed.
- It can be very time-consuming, because unproductive lines of inquiry are an inevitable part of the process. It can also be demanding on tutors' time and knowledge too in offering guidance, because attempts to solve problems can be very different from each other.

Nevertheless, there have been interesting experiments in problem-based learning in medical and mathematical subject areas that have drawn praise from many students. In particular, there are suggestions that PBL can foster the "strategic" approach to learning described in section 2.13 above.

Narrative-based learning

Schank & Abelson (1995) suggest that stories about experience are the basic components of human memory, knowledge, and social communication. New experiences are interpreted in terms of old stories, and shared story memories within social groups lead to social learning. Stories can make a subject more memorable, provide structure, provide familiarity, and provide context.

Broadening the idea of narrative out from the idea of "story", one can see that models, anecdotes, case studies, viewpoints, sociological or psychological concepts, legal cases, medical cases, historical accounts, scientific explanations, company "war stories", and the like can fulfil a similar role. Ausubel (1963) introduced the idea of "advance organisers" that serve to explain, integrate and interrelate existing knowledge and then act as a bridge to new ideas. Narrative can provide these organisers, which is particularly potent in the case of abstract ideas.

We have used narratives extensively in this report, for example. We have used case studies from the OU to illustrate the range of choices faced by course teams. We have conjured with hypothetical trends (in technologies, pedagogical practices and psychology, for example) to provide structure and memorable starting points. We have encapsulated complex learning theories and pedagogical approaches in simple accounts that provide the essential ideas without gross damage to the complexity.

There are obvious disadvantages to this approach:

- Narratives rarely capture the whole truth, and sometimes finesse complexity in the interests of a satisfying story.
- Unlike resource-based learning, problem-based learning, and collaborative learning, narrative-based learning is not inherently constructivist. It can be made so, by encouraging students to explore and share narratives; but it is typically used by course designers to *present* to students a limited number of viewpoints, rather than encouraging active construction of knowledge.
- Students can miss the point of the narratives, because they become fascinated by details. For example, our mention earlier of the fact that there were 10,000 students in T171 might have raised questions about how many years this level of enrolment was sustained, whereas the point was about the ability of universities working at scale to do things that courses catering for tens of students cannot do (and vice-versa).

Nevertheless, narrative is a powerful tool that can play a role alongside other pedagogical approaches.

Communities of practice, cognitive apprenticeships and situated learning

In an influential paper, Brown & Duguid (1991) use an account of an ethnographic study of IT support staff to illustrate key themes in a socio-cultural account of learning, and the value of work communities as sites for learning. Lave & Wenger (1991) meanwhile, give an example of the typical Yucatec midwife, who typically starts her career listening to the stories of her mother or grandmother, later accompanying them on visits, then helping out in small tasks, and then taking on more tasks until eventually she is capable of supervising a birth. Lave and Wenger describe this process of informal apprenticeship learning as moving from "peripheral participation" in a community of practice, to central participation.

Such ideas have led some to propose a formal pedagogical approach in which learning is based on "legitimate" peripheral participation in a community. The learner undertakes collaborative activity strongly related to the actual activity of practitioners in the community ("authentic" activity), and begins to exchange narratives, and build trust with expert practitioners.

It can be seen then that such an approach shares elements of each of the other pedagogical approaches above – the focus on authentic problems and resources, collaboration, and narratives – the crucial emphasis here in "situated learning" being on phased participation in a specific community. This model is seen as suitable for many kinds of vocational education.

However, the emphasis on the specificity of practice communities, and particularly on physical co-location, might seem in direct contradiction with online learning, which some have lauded as freeing learners from the constraints of time and place.

Nevertheless, Weller (2002) notes that the internet is a "medium built around communities" and we can see practitioners linking with each other outside traditional boundaries of location. Moreover, Thorpe, M. (2002) argues that developments in telecommunications and computers can, in theory at least, allow learning to be integrated with practice rather than pursued through "time out" from practice.

Mixing pedagogies online

The choice of pedagogical approaches will depend on the learning objectives; the preferences of the course designers, the prospective tutors and the prospective students; and the available resources. However, it is clear that multiple approaches can be combined successfully within an online course. Weller (2002) notes that…

> "This means that not only can each be used where it is best suited, but it also makes for an interesting course. The danger is that students feel they have just become comfortable with one approach when a new one is thrust upon them which can be disruptive. However, many of the approaches are complementary. For instance a collaborative activity can be implemented within any course, or narrative used as part of a situated approach." (p. 89)

It is sometimes claimed that a "Learning Object approach" to creating courses (see section 2.9 above) is pedagogically neutral, in the sense that a course can consist of Learning Objects with different authoring styles and pedagogical approaches. This claim has some merit, in that one Learning Object could, for example, be based on resource-based learning; another on collaborative learning; another on problem-based learning; another on narrative-based learning; and another drawing on the apprenticeship or situated learning models.

However, by favouring the authoring of self-contained components, to the exclusion of integrated narrative arcs, one could argue that the Learning Object approach is clearly *not* pedagogically neutral. Such integrated narrative arcs are a popular technique for reinforcing learning, encouraging reflection, and enriching understanding of the interconnectedness of course themes. It is interesting, then, that the creators of the course H806 (*Learning in the Connected Economy*), who are enthusiastic advocates of the Learning Object approach, found that in order to produce high quality learning experience they had to "cheat", in that they also used "narrative objects" that (unlike a purist's Learning Object) could refer to other objects.

SUMMARY

- A judicious combination of **pedagogical approaches** can be most effective:
  - **Resource-based learning (RBL)**: exploit a variety of data sources.
  - **Collaborative learning**: small groups of students work together.
  - **Problem-based learning (PBL)**: start with problems not information.
  - **Narrative-based learning**: use the power of stories and case studies.
  - **Community of practice**: use authentic activities for apprenticeship.

2.16 Summative assessment

OU policy is that learning outcomes are clearly articulated at module, course and programme levels, and that assessment is focused on properly testing the achievement of these outcomes.

We have already briefly considered *formative assessment*, i.e. ongoing assessment as means of helping students learn. Appropriately placed outcomes-based formative assessment opportunities built into courses are seen as of crucial importance in promoting student achievement and the building of self-confidence.

We now consider *summative assessment*, which is about checking whether students have met certain standards.

Examples of online assessment methods include:

- electronic submission of assignments prepared offline;
- web assessments, in which students individually or collectively create a set of web pages; for example, a review or critique of readings or websites;
- assessments based on contributions in a computer conference
- multiple-choice quizzes

A number of important lessons have been learned at the OU.

First, while there is an increasing emphasis on a student-centred approach to teaching and learning - and hence to assessment - this approach needs to be balanced with the demands of the institution as certifying a particular standard. Common standards can sometimes be at odds with tailoring assessment to the individual student. At the same time, being explicit from the start about the marking criteria and standard expected on assignments is clearly helpful, and should be closely related to the learning objectives. There should also, ideally, be opportunities for students to put into practice the feedback received from the tutor earlier in the course.

Secondly, as with the choice of pedagogical approaches, employing a variety of assessment methods on the course will help avoid disadvantaging particular type of learner; however too much assessment can lead to surface learning (see section 2.13

above). Another temptation to be avoided is to assess only the parts of the course that are easy to assess.

Thirdly, there is evidence that optional components in a course tend not to be valued as highly by students: that a component is typically seen as more valuable when it is integrated into the course assessment strategy.

The issues of cheating and plagiarism are also often raised in relation to online assessment. How can we be sure that the person who wrote the exam is the person whose name is on the certificate?

One strategy is to design assessment questions which are integrated with the conference interactions. For example, the assessment might involve writing-up an online debate, or re-working a draft assignment on the basis of comments by the tutor and other students. Another strategy is for the assessment to ask the student to draw on their own personal context, their job for example. Such strategies mean that assignments bought on the Internet - or created by cutting and pasting large amounts of someone else's text - would not be relevant. Another approach entirely is to use software program that analyse scripts, looking for indications of plagiarism; these programs are growing in sophistication.

At the same time, the sharing of assignments among students within a tutor group can have great benefits, but there can be a natural reluctance to share!

SUMMARY

- The "**assessment strategy**" needs to balance student preferences with the certification of standards.
- Over-assessment must be avoided, but course elements tend to be valued more if they are assessed.

2.17 OU course development processes and roles

Comments received on the first draft report included a request to provide greater detail on organisational processes in the design of online learning at the OU, such as: Who plays what role in the design and delivery process? What kinds of resources are needed (human and physical)? How does the process typically unfold?

The OU is clearly a very different organization from any of the C3D project partners (the closest perhaps being the University of Cape Town). Our unique history means there are limits in terms of the translation of our experiences to the C3D contexts. Indeed if the OU were starting out to become a provider of e-learning today, we would not start from the place we have evolved to. With those caveats, we hope the following information will be helpful in stimulating reflection among C3D partners on the challenges that lie ahead in developing in house e-learning capacities for the future. It cannot be stressed too emphatically that the OU's approach is unique and on an "industrial scale" where, for example more than 20,000 students will study a course before it is updated. For this reason the resource inputs in absolute terms

appear vast and expensive if they are not considered in their “per student credit” terms.

A rough description of OU course production processes involves four phases:

1. Initial development phase
2. Design phase
3. Production phase
4. Presentation phase

An outline of these four phases is given below, along with an overview of curriculum decision-making approvals processes, and the roles and functions of members of “course teams”.

Initial development phase

Open University curriculum planning is the conclusion of a number of institutional and academic review activities and is itself ongoing and iterative, reacting both to external influence and to internal, organic development.

Proposals for new courses emerge by a variety of means:

- reviews of the external environment, social and demographic trends;
- the need to replace or update courses to reflect changes to the subject matter or new methods of teaching and assessment;
- business appraisal, market surveys, sales forecasts;
- the requirements of professional bodies, quality assurance bodies and other influences on academic standards;
- feedback on course presentation.

Most of all, courses begin with academic reflection, ideas, enthusiasm and energy.

Once a proposed course has had a successful business appraisal (see “Approvals processes” below), a **course team** is appointed (see “Roles and functions of OU course team members” below). The course team is a group of academic and other staff appointed by the board of an academic unit to devise and produce an OU course.

It is the course team that initiates course planning and gains specification approval of course elements:

- Academic purpose and content: Aims and objectives
- Academic unit and curriculum context
- Academic level
- External funding
- Market Research
- Commercial strategy
- External recognition
- Admission policy
- Awards to which course will count
- Presentation pattern
- Tuition and Assessment strategy
- Course materials strategy: Main and supplementary text
- Set books
- Readers

- Broadcast/Cassette/Audio CD
- On-line delivery
- Course team appointment
- External assessor appointment

Effective scrutiny and approval of a course specification is a critical stage in demonstrating compliance with the University's policies and effective operation of quality assurance procedures. The course specification should confirm information outlined in the curriculum plan. Approval of the course specification in most academic units marks the starting point of the course team's concentrated work in developing the course. The approved course specification remains an accurate picture of the academic purpose defined for the course against which the resultant product can be measured, an outline agreement on the design for which resources are to be provided, and an outline statement on the course for use by all areas in preparing for the production and presentation of the course.

Approval processes

Curriculum planning encompasses activities undertaken by academic units separately and by the University as a whole, taking account of institutional aims and objectives.

Approval processes include a rigorous curriculum investment decision-making framework. This framework combines clear accountability for taking investment decisions with an appropriate degree of subsidiarity.

The framework involves five 'stages' and each stage is concluded by a gateway review in which a designated gatekeeper is responsible for deciding whether the project should proceed to the next stage. The framework specifies the information needed to support each gateway review, identifies the gatekeepers and what their decisions cover. Each gateway decision only covers the release of resources for the next stage.

The five stages are:

Stage 1: Opportunity review - initial options analysis and selection of those projects for which a full business appraisal should be prepared.

Stage 2: Business appraisal - completion of the options analysis and selection of the project which it is proposed should proceed to the completion of a specification.

Stage 3: Specification - preparation of a programme or course specification; appointment of the course team and external assessor; commencement of authoring, production and other aspects of preparation; preparation of course descriptions for inclusion in publications.

Stage 4: Post-launch review - a first check on whether the actual outcomes (e.g. student numbers, pass rates, feedback, retention, progression) are consistent with planning assumptions for the course or programme.

Stage 5: Lifecycle review - a full review of the programme or course including a reassessment of the business case and its contribution level at a point when a decision has to be made about its future - whether to remake, extend the life or de-commit. This stage is seen as an integral part of annual faculty curriculum planning activities.

Design phase

The course team finalises the course design. Design approval is concerned with the preparation and approval of detailed plans for the production of course materials and for the delivery of services to students. Design approval is not concerned with statutory academic approval matters controlled by the Senate, but with detailed matters of operational feasibility and resource use:

- detailed course design production plans;
- detailed course inventory;
- detailed draft schedules for text;
- BBC/TV schedules;
- iterative process of development for new media.

It is still the case that most courses revolve around a main print component that might be a book, or course units and students are referred to other media to carry out various exercises.

The University's overall teaching method is termed Supported Open Learning™. Four key elements underpin the OU's success in delivering an integrated system of supported open learning:

- high quality, multi-media teaching materials;
- locally-based tutorial support;
- first class research and scholarship;
- highly professional logistics.

Production phase

Once design approval is obtained the course team begins the task of writing course units, preparing Readers, developing TV and audio materials and developing content for websites and CD-ROMs.

From the beginning, the OU has taken as one of its top priorities the development of instructional materials of the very highest quality. Respected academics from other universities work alongside experienced OU colleagues in planning and preparing courses, sharing drafts of materials, and revising and reshaping them in the light of team discussion. Qualified educational technologists, and OU editors and designers contribute pedagogic and technical expertise through all stages of course development. External assessors from other universities ensure that the academic standards are consistent with the rest of the sector. In recent years, the course teams have been constituted slightly differently, to include those versed in the new knowledge media and in the application of video, computer and communication technologies to teaching and learning. But the principles of co-operative working, and of mutual assurance of quality and standards, remain the same.

Each type of material has its own production methodology. Course units once written, are handed over to internal editing staff for editing and design studio work. Readers are produced for publication by external publishing houses. Media are developed, assembled and delivered through a co-operative process between course team members, editors, software designers and designers. The approval of the external assessor is sought for each element of the course.

The course team will agree a way in which to develop the material that usually involves turning a course outline into draft units. 'Draft zeros' are usually detailed

unit outlines that may also show how media other than print fit with the unit. There are usually two or three drafts of each main unit of material that follow a draft zero. The number of drafts often reflects the experience of the course team and also whether materials are being reused.

For each draft of every unit, there will be a course team discussion to go through the details for a second draft. That discussion informs all of the authors about issues that they might have to address when preparing other units. It is normal for authors to pair up and comment in detail on their partners' work although all the authors would be expected to read all the drafts and at least be aware of the teaching material that is covered elsewhere. In addition to course team comments, the course team receives feedback from Critical Readers and developmental testers (used primarily where a lot of new software is being written). Critical Reader feedback plays an important role in this process because after many months of intensive effort, the course team can become too close to the material to notice some of the flaws.

There are frequently conflicting views at these discussions but they usually settle into an agreed way forward. This means that not all comments are acted upon, but without the comments, or the discussion, we cannot know or prove that we have a single approach to teaching a course that works.

Presentation phase

Assuming everything goes to plan and the external assessor approves the course, a course is then ready to be published and presented.

Study plans are drawn up for all courses, and course materials are delivered in a phased way to coincide with student use dates. A proportion of the materials for each course are annual items that are re-made for each presentation. Surveys of student experience and individual feedback from students and tutors form the basis of regular updating activity.

Roles and functions of OU course team members

A course team will be brought together to develop a new course. Open University course teams typically comprise the following key members:

Course Team Chair – who has overall responsibility for the course and who is the academic lead for the course. The chair is often an author as well.

Course Manager – whose primary concern is to manage the course development process, check timely delivery of the production process and ensure that quality processes are followed.

Academic authors – who work with the chair to design the course; write the course text; create practical activities; contribute to the production of audio, video, software and other media; prepare assessment material; and cross check each other's work. Occasionally consultant authors are asked to work on a course team too.

External assessor – who, as a senior academic from another university, verifies that the course is fit for purpose and of the required university standard. All university courses have to be approved by an external assessor before they can be presented.

Course secretary – who provides secretarial support and is also responsible for ensuring that all course materials are keyed in the correct style for electronic publishing.

In addition, course team meetings might include, from time to time:

Academic editor – who checks that the material generated from the various authors is consistent across the course and provides a clear approach to a particular subject.

Project Officer – who might be allocated on courses that require software exercises, or specialist website functions or any other relatively small scale technical development.

Critical readers – who provide feedback on the course materials and software, particularly on the level of the course, student workload, and educational effectiveness.

Staff tutor – who provides a regional and Associate Lecturer perspective.

A member of the Institute of Educational Technology (IET) – who provides advice on the teaching strategy; the use and mix of media to be used; the testing of materials prior to first presentation; and the evaluation of the course during presentation in order to provide data for revising the course or some of its components.

A Learning and Teaching Solutions (LTS) project manager – who advises on the use and mix of media; plans and schedules production or buy-in of media components; and deploys and manages media developers to produce the course.

A member of Library staff – who supports the information needs of authors; writes materials to develop students' information literacy skills; facilitates student access to digital information sources such as bibliographic databases, full-text journal papers, newspaper articles, electronic books and reference works; co-ordinates the clearance of rights on materials sourced through the library.

Media assistant – who checks rights on 3rd party materials, and renders text and images to print and interactive media.

Other staff may also be involved in course team meetings, including interactive media developers, designers, and AV staff. LTS provides a range of media experts, some of whom will work directly with course teams, others have an advisory role. See "LTS production roles" below.

The role of the course team chair

The main role of the course team chair is to ensure the course is delivered on time with the minimum of fuss. It is to act as an interface between course team members, who are focused on the needs of their course, and the production system within the University, which sees the course as just one of many new ventures.

This will mean the course team chair has to keep many balls in the air:

- Providing leadership within the course team.
- Maintaining a creative tension without the disintegration of the course team.
- Ensuring the goals of the course are delivered in practice.
- Ensuring that the material is delivered according to the various deadlines agreed by the course team.
- Managing the resources allocated to the team in a creative, effective and efficient manner.
- Maintaining links with the Faculty, Programme and Discipline to ensure the course matches the needs of degree structures.

- Ensuring that all aspects of the production system are aware of the needs of the course, and providing the information to the University in good time.
- Picking up the pieces when things go wrong, often as a result of situations that have nothing to do with the course.
- Maintaining links with the regions, and assisting in the recruitment and training of Associate Lecturers.
- Ensuring the accuracy and suitability of the assessment material.

Typically it is the course chair who will defend the course's teaching strategies and content as the course passes through the various quality control processes in place within the University, from Faculty Board, through Courses Committee etc. Most aspects of this role are performed in close collaboration with the course manager. In many cases the course team chair is also an author of course material.

In practice, the role of course chair may involve cajoling authors to hand their manuscripts in by deadlines, revising strategies as the University changes its policy, writing descriptions of course content and teaching strategy of various lengths, chairing course team meetings, giving detailed feedback on the various drafts produced by authors, planning residential schools, recruitment advertising and so on.

Chairs are also formally responsible for the course budget, and making sure the various elements do not exceed the amounts allocated. (In practice, this falls to course managers, but there is a sense in which the course team chair should ensure that decisions made on academic ground are within the framework of the agreed course budget). Once the course is in presentation, the role of the course chair changes somewhat. He or she is then responsible for the smooth running of the course, including scrutinising the overall balance of TMA and examination questions, overseeing the monitoring process, briefing examiners, chairing the standardisation and awards examiners' meetings, responding to feedback (such as the mid-life review). The course chair may also be involved in appointing residential school tutors, and visiting lecturers.

The role of the course manager

The course manager is responsible for three main tasks

- to provide organisational support to course teams at all stages of development from planning, through production, to presentation;
- to contribute to course creation and maintenance, including taking initiatives in relation to the organisational and, where appropriate, the teaching aspects of courses;
- to liaise between course teams and other areas of the Faculty, areas of the University, and with external bodies of all kinds.

The course manager's role includes preparation of bids for the production and maintenance of the course. These bids may be for the approval of the course; for resources for the course; or for some major course components such as multimedia, computing, assessment or residential elements, for which the University or Faculty requires a specific approval process. Close liaison between course manager and the Learning and Teaching Solutions (LTS) project manager is essential from the earliest planning stages of the course to ensure that the course team define their intended learning outcomes as soon as possible and are helped to specify the media requirements to deliver them cost effectively.

Course managers are also responsible for updating PLANET, the centralised information database of all of the University's courses.

The course manager is responsible for scheduling the early stages of the development of course material, in conjunction with those exercising an overall project management function within faculties. Scheduling of ‘handover’ dates of material into the production system and subsequent production stages is done by the LTS project manager responsible. Again close collaboration between course and project managers is required to ensure effective dovetailing of schedules.

While the outline curriculum and the structure of the course is being developed the course manager may be analysing feedback and surveys on other courses, components or teaching strategies, and drawing up reports for the course team to help them develop their teaching strategy. Experienced course managers make a significant input to the development of embryonic courses. Experienced course managers will also advise the course team on aspects such as equal opportunities, the use of media, study level, reading speeds etc. as well as on cost issues mentioned above.

The more regular tasks which are performed during the real production phase of a course would include contributing to the drafting of a wide variety of non subject-specific course material, such as study guides, as well as commenting on the material produced by others.

This could include creative influence, such as: commenting on or preparing various parts of the course material; ensuring a proper degree of co-ordination and cohesion between the components of the course; and briefing consultants and Associate Lecturers; arranging developmental testing and feedback.

There are individuals and groups who are not members of OU staff who are normally associated with a course team. These would include consultants, external examiners and assessors, and representatives of institutions with whom the course team is collaborating. The course manager may negotiate with, and where necessary, brief these associates, draw up contracts, monitor their progress, and ensure the completion of work and subsequently the prompt payment of fees.

Course managers have to monitor and manage the production of all course material, whatever media by which it is being delivered, from first draft to final product to ensure its prompt despatch to students. Initially this means ensuring the members of the course team and consultants produce to time, but in addition that the other features of the teaching, whether written or employing other media, all come together at the right time. This includes photographs, diagrams, sketches, animations etc. For many of these, as well as text, copyright permissions will need to have been obtained, and it is the course manager who is responsible for applying for such permissions in good time.

There are many administrative arrangements required for the proper presentation of a course. Examples are preparing assignment parameter forms and creating content checklists. Most course teams hold frequent regular meetings and the course manager is responsible for preparing the agenda, organising the distribution of papers, taking the minutes and making any other necessary arrangement for the servicing of such meetings.

During the production phase many areas of the University need information about the course and its various components. All such queries are channelled through the course manager.

Once the course is in presentation many of the foregoing duties still need to be maintained, but often at a much less intense level. Two areas of work now have an enhanced position. The rate of correspondence from students, external organisations and others increases considerably. All these are initially the province of the course manager. If not able to deal with them directly, the course manager must refer to others but take ownership of the query and ensure that a reply is ultimately made.

During the first presentation the course manager is responsible for ensuring that appropriate mechanisms to collect feedback on the presentation are in place, and subsequently for its collation and analysis. In addition, the Institute of Educational Technology (IET) runs a standard survey of first-year courses which forms an important part of any feedback analysis. As well as reviewing the success, or otherwise, of a course and its various components for the purpose of improving subsequent presentations, there is an increasing need to prepare documentation for both peer and external review procedures.

While setting out the financial base on which a course is being produced is a key function at the start of a life of a course, courses need funding for a variety of purposes throughout their lives, and the course manager is responsible for estimating such costs and, for certain classes of expenditure, monitoring the efficacy of those estimates.

LTS Production Roles

Once all of the material has been finished academically, it moves into a media development and publishing process that is handled by Learning and Teaching Solutions (LTS). On learning that a new course is being developed, LTS allocates a production team to a course that will include:

Project manager – who manages the course's media development and publishing process.

Publishing editor – who makes sure that the text is articulate, sensible and readable. Usually the editor is someone with substantial experience of the general academic area.

Interactive media developers – who develop educational software to meet course team needs or advise on the availability of appropriate commercial software; and develop online materials and services.

AV staff – who produce audio-visual components of the course

Designer – who develops a style for the course and its texts, figures, pages, and packaging, i.e. the general look and feel of a course. The designer is expert in issues such as effective use of colour combinations, effective layout, and disability/accessibility issues.

Graphic artist – who produces the images and artwork.

Software QA tester – who ensures that the software works on a wide range of machines.

Web designer – who creates a structure for web-based materials.

Print production manager – who arranges for all material to be printed (frequently 5000 to 50 000 copies of any one item depending on the expected student population), advising on paper type, weight, finish, binding, and cover options.

The production team and course team work very closely together to establish how to publish the material given the various constraints.

2.18 D833 Environmental Negotiation Course

As outlined earlier in this report, the Open University's course *Environmental Practice: Negotiating Policy in a Global Society* (course code D833) is an experimental masters course using ICTs in an innovative way to teach the theory and practice of environmental negotiation and conflict resolution.

Because of the interest shown in D833 by the C3D partners, we provide here some additional details. It also helps to illustrate some of the theoretical points made earlier. This account draws heavily, with gratitude, on Humphreys (2002), Thorpe, K. (2002) and Price (2003).

Aims and approach of the course

D833 aims to teach students the theory and practice of international environmental negotiation. Students are introduced to theories of negotiation, international cooperation and international environmental law.

Six online tutorials are held during the course using Lyceum, the Open University's audio-visual conferencing software. There is no face-to-face interaction on the course.

In addition to the tutorials, Lyceum is used to help students to participate in role-play simulations of multilateral negotiations at the United Nations. The simulation provides a 'laboratory' for students to experiment with and enhance their understanding of the theory introduced in the course. Students are guided in using theory (i) to participate in the simulation as interested participants with a vested stake in the simulation, and (ii) to explain the process and outcome of the simulation as disinterested objective scholars. Students thus gain experience in working with theory in two different though interrelated roles – those of the practitioner and the social scientist.

Use of Lyceum

Lyceum can fill various teaching needs: moderated tutorials, using shared applications with which students collaboratively work on ideas; student 'self help' groups; and live role-play simulations. It is this last area with which we are concerned here. Three Lyceum modules have been developed. *Concept Map* enables students collaboratively to chart concepts and their relationships by posting, labelling and linking nodes (boxes). *Whiteboard* is a shared canvas which students can use to draw simple diagrams and to import electronic images from outside Lyceum. The third module – *Document* – enables the collaborative writing and editing of text. As well as working online, students can work offline with each Lyceum module at home.

Figure 13 below illustrates the online D833 interface, showing the Document module.

There is a Plenary room where the master text is kept. Smaller pieces of text may be assigned to Working Group rooms for negotiation. Students change rooms by clicking on the room they wish to enter. In the figure shown, The Plenary is greyed, indicating that this is the room in which the user is currently located. The 'Yes' button is greyed, indicating that the user has voted 'Yes'. The ticks indicate users who have voted 'Yes'. Note the vote tally.

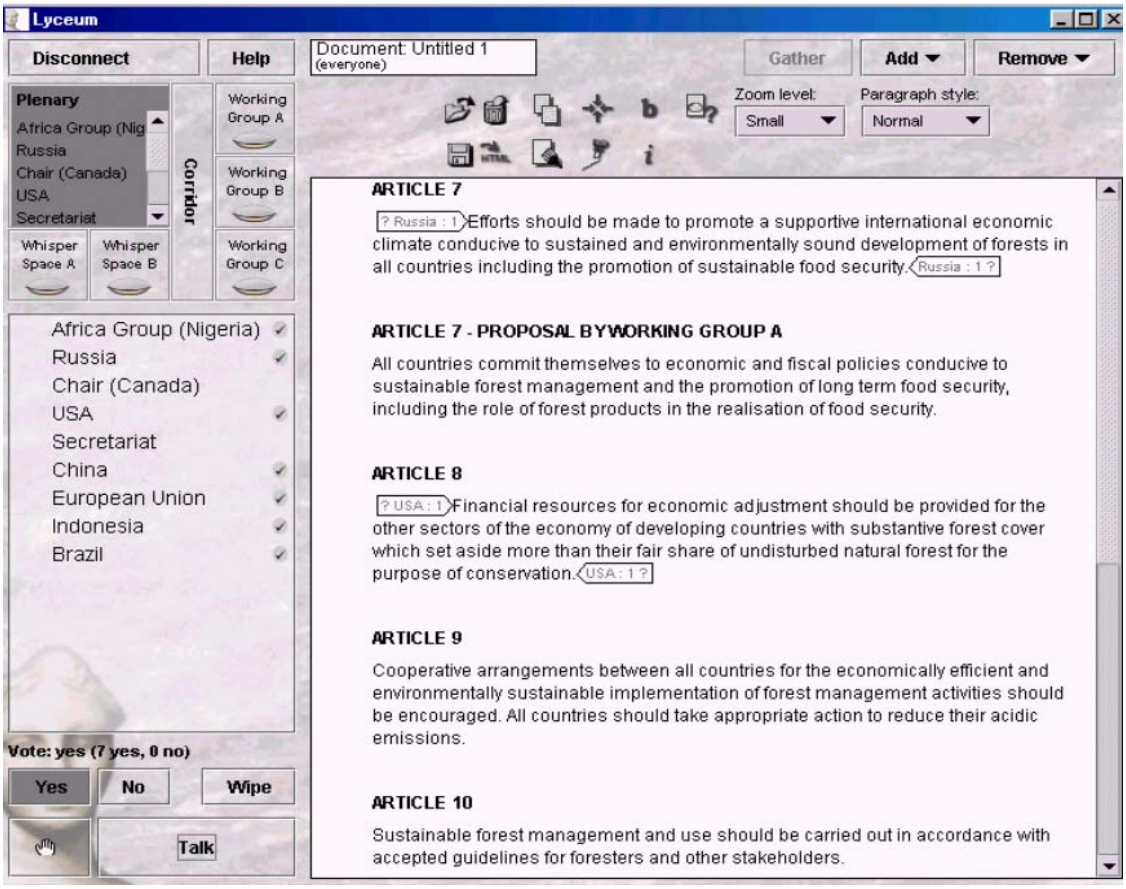

Figure 13: Lyceum interface using the Document module

Details of the simulation

The course aims not only to explore theories of international negotiation, but also for students to put these theories into practice through the Lyceum simulation of negotiations at the United Nations in New York. The students are thus provided with two perspectives on the theory of the course. First is the objective and disinterested viewpoint of the academic social sciences scholar. Second is the subjective and utility-maximising viewpoint of the policy practitioner aiming to realise set objectives. With respect to the second, there is a reflexive and iterative relationship between theory and practice as students are able to bring their experiences of negotiation in the simulation to bear on their comprehension of the course material.

Each student is given a role as a government delegate of a country to represent throughout the course. The student becomes familiar with that country's particular interests and the interest groups that can impact upon them through printed resources, i.e. a 'country profile' and online resources such as a link available through the D833 home page. One of the things that students explore is to what extent a country's 'national interest' is essentially 'given' through the country's position in the structure of the global political economy, and to what extent cognitive dynamics, such as the values, principles and beliefs of individual policy makers, play a part. With respect to the latter students are able to bring their personal perspectives to the country's stance. This allows them to develop the country's line on the issue throughout, making adjustments to their strategy and use of concessions. Thus students are provided with the experience of practical application of the theory and of using negotiating skills.

There are nine 2-hour negotiation sessions, the last replicating a two-week UN conference. The objective of the negotiations is to agree an International Convention on Forests. Delegates elect a chair from amongst themselves for each 2-hour session. No-one has to put themselves forward as a chair, but anyone who wishes will be given an opportunity to do so in one of the groups.

The course draws heavily on the UN's procedures. Discussion of separate paragraphs of the agreement is assigned to Working Groups who report back to the Plenary where the master text is kept. The Plenary itself uses a consensual voting system like the UN and, as in real life, the need for consensus can dilute the thrust of the agreement. Students are called 'delegates' whilst in a session and have to address colleagues in diplomatic language of the type used at the UN. Formal votes in the Plenary have to have a proposer and seconder, with proposing and seconding being carried out using the Lyceum Text Chat. However, the course material emphasises that formal votes are to be used as a last resort and never to censure other delegates.

Twenty students per tutor group is considered reasonable, with as many tutor groups as needed to satisfy student demand. However, pedagogically the course could work with four students, the minimum to give an effective multi-lateral perspective.

Adaptations of the software made to simulate negotiation dynamics

Research for the course included a visit to the 4th session of the Intergovernmental Forum on Forests at the UN in New York in February 2000. This visit suggested to the course chair (Humphreys, 2002) some important informal, often hidden, dynamics of multilateral negotiation that the course team incorporated into the simulation. See Table 2 below.

Informal dynamics of multilateral negotiation	**How these dynamics have been incorporated in the D833 simulation**
Many important deals are brokered informally in 'the corridors'.	The D833 Corridor… is a public space where any delegate can participate in informal discussion.
Private whispered discussion frequently occurs during multilateral negotiations.	There are two Whisper Spaces. These are best conceptualised as private spaces at the back of the Plenary. Delegates can converse privately while continuing to observe modifications made to the Lyceum Plenary modules.
'Who is talking to who' is an often hidden dynamic of multilateral negotiations. Keeping track of this can provide clues to the sort of deals being brokered.	At the bottom of every room (except the Plenary, where occupants are listed separately, and the Corridor) is an 'eye'… When a student clicks on the 'eye' a drop-down list appears of all the occupants in the room.

Table 2: Informal dynamics of negotiation incorporated in the D833 simulation (from Humphreys, 2002)

D833 replicates the UN convention of using square brackets to make suggested amendments to agreement texts. This can lead to a confusing mass of alterations, so (for clarity) Lyceum dispute tags are used to show the amendments with the name of the country that has suggested them. These can be subsequently accepted or deleted. Like the UN, D833 has a Secretariat, personified by a tutor (an OU "Associate Lecturer"), who tidies up agreements that have been through multiple amendments and edits them into a form suitable to be voted upon.

For D833 both the textual and verbal aspects of Lyceum are important. Rather than the usual model of a common conference area and 'break out rooms' for conversations among a sub-set of the group, D833 has a number of spaces with different rules which seek to replicate aspects of the actual UN. The 'eye' icon can be used to see where all the delegates are at any one time within this framework: this captures an important aspect of negotiation, namely the informal dynamic of 'who is talking to whom informally'. The Plenary is where the formal business of the negotiations is conducted.

There are the two Whisper Spaces that form a sub-section of the Plenary. Delegates can go into these areas, which only have verbal functions, for private discussions during a Plenary session. Delegates in the Whisper Spaces can continue to see the work on the text in the Plenary. These two spaces have stricter rules than is common when using Lyceum. Delegates can only join other delegates there if invited and have to leave if requested. All conversation in the Whisper Spaces is confidential.

The Corridor is an informal discussion area. The three Working Group areas are where parts of the master text can be subsequently amended by sub-groups of delegates before being brought to the Plenary. In these areas delegates can use the Concept Map to share and organise their ideas communally. This function allows students to create separate text boxes to aid discussion. Delegates can write freely into these only revealing them to colleagues when they have finished.

There are three 'brainstorming modes' which can be used for such discussions using the Concept Map. Mode A: boxes are labelled by country name and each country may make any entry to their box without prior discussion with other delegates. Mode B: boxes are labelled by country name, but each delegate will discuss proposed entries before typing them into the box. Mode C: boxes are labelled by subject matter and topic, and each delegate will discuss proposed entries before typing them in. For all three modes the chair of the session draws up a composite box for reporting back to the Plenary. Students can save a completed Concept Map to their own computers to retain as a record. The Whiteboard function, used on other courses with Lyceum, is also available but for D833 this is only used for tutorials as it was felt that the Concept Map and Document modules were sufficient for the negotiations, and the inclusion of Whiteboard could confuse matters.

Lyceum accommodates the different types of voting needed by D833. There are procedural votes to check that the system is working for all of the participants. There are preference votes called in sessions which gauge the mood of the delegates. Finally, the formal votes in the Plenary are proposed and seconded via the Text Chat box as noted above.

Documents are added to the text areas by tutors for students to negotiate and amend. However, material can also be cut and pasted from sources external to Lyceum. This allows students to assemble proposals offline and bring them complete to the negotiations using the Add/Remove buttons. Delegates can then put 'dispute tags' around sections of the documents that they disagree with. Using the Accept/Destroy function for these disputed passages can only be done consensually.

A text-based FirstClass conference was created as a fallback technology, in case of systemic break down of Lyceum. However, this has the disadvantage of being less synchronous than Lyceum and does not involve audio interaction, with the result that the learning experience is different. Humphreys highlights the fact that when using

Lyceum, one cannot see the facial expressions and body language of the other delegates, although pauses and intonations can be communicated. However even these cues are not possible in FirstClass.

Reflections on the pedagogic strategy

Humphreys (2002) describes how the D833 course team drew upon the OU's accumulated expertise in using the *Lyceum* synchronous conferencing system and asynchronous conferencing such as FirstClass for other courses:

> The OU has found that in order to be effective:
>
> - Computer conferencing should have a clearly defined place within the course (and should not be a 'bolt on' feature).
> - The learning objectives of computer conferencing should be clearly defined in advance.
> - Computer conferencing should be effectively moderated.
> - There should be opportunity for individual reflection and/or group debriefing and/or tutor feedback of what has been learned from computer conferencing.

He goes to reflect on the course team's approach to teaching negotiation and theory relevant to environmental policy-making. Note how the approach draws on the social constructivist ideas, outlined in 2.13 above. We quote at length, because of the obvious relevance of this work to C3D's interests.

> D833, which aims to be policy relevant, sets out to teach negotiation as an essentially social activity. The simulation enables students to understand the interactive dynamics of negotiating. It is impossible to capture and represent this using conventional print resources. The simulation also provides a framework for situated learning, and embodies the idea that learning is a progression.
>
> The use of the simulation emphasises that negotiation is a *mutual learning process*. At the start of the simulation the collective knowledge of the participants is unevenly distributed and dispersed amongst delegates. This will change as the simulation progresses: if there is to be a negotiated settlement some coordination between delegates is needed, and this can only take place through interaction and mutual discovery.
>
> Learning requires active engagement and practice. As Knight and Trowler [2001] argue, deep learning requires not only a thorough comprehension of theoretical and conceptual ideas; it also requires application. If skills are to be learned there must be opportunity for feedback, reflection and fine tuning. The D833 simulation gives students the opportunity to understand theory through the provision of a focused collection of readings and an accompanying Study Guide, including interactive exercises.
>
> The course teaches social science theory from two perspectives: that of the academic; and that of the practitioner. First, students are taught to relate theory to practice as social scientists, that is to explain and analyse the process and (at the end of the course) the outcome of the simulation. Students are required to disengage from their role, viewing their performance in the simulation objectively and disinterestedly as an object of study.
>
> Second, D833 makes explicit the iterative relationship between theory and practice. Students are guided to use their theoretical and conceptual understanding of negotiation in the 'laboratory' of the simulation. Reflexive thinking on the use of theory in the simulation will reinforce students' understanding both of negotiation and of using theory as a practitioner. Students thus gain a first hand understanding of the iterative relationship between theory and practice.

There are five Tutor Marked Assignments (TMAs) in the course. The assessment strategy of the course follows on naturally from the practical approach adopted:

> … all TMA [Tutor Marked Assignments] and examination questions focus directly on the simulation and require students either to use theory to analyse the negotiations as an academic observer or to explain their negotiation aims, strategy and tactics in the simulation using course theory. An example of a question that assesses student ability to analyse the negotiations as an observer is:
>
> *'Judging from events so far in the simulation, future negotiations will involve delegates negotiating alone, rather than forming themselves into coalitions.' Discuss this statement with reference to the simulation.*
>
> This question assesses students' understanding of coalition theory, and their ability to use such theory to interrogate and evaluate the processes observed in the simulation. The relationship between the theory of the course and the negotiation simulation is thus central to the D833 assessment strategy. It cannot be neglected if students are to be successful on the course. Note that the assessment strategy is not separate from the pedagogic strategy. Students are advised that in thinking through their TMA answers they may gain useful insights that they can employ as a delegate later in the simulation.

So, although there is an inevitable 'guillotine' to the simulation (in that if students are to have reached agreement they must have done so by the end of the ninth session), for the learning objectives of the course, it is irrelevant whether a negotiated agreement is reached: an 'unsuccessful' outcome may be every bit as instructive in learning terms as a 'successful' one. Students are encouraged to reflect on their progress by keeping a negotiation journal (which is not assessed).

Humphreys summarises the relationship in a learning context between the student role and delegate role in a table (reproduced here as Table 3 below).

Course component	**Student role**	**Delegate role**
Computer conferencing	e-tutorials moderated by a trained tutor	Negotiation simulation moderated by the 'Secretariat' (trained OU tutor)
Guided use of theory	To analyse the simulation as an objective observer	To inform negotiation aims, strategy and tactics
Interacting with peers	In tutorials or using email: debate the course material with other students as scholars	In the simulation or using email: Pursue the 'national interest' while also working with other delegates to solve a common interest problem
Feedback	From tutor (TMA marking) and from other students in e-tutorials.	From other delegates: informally by email and in formal negotiating exchanges in the simulation.

Table 3: D833 learning methodology (from Humphreys, 2002)

Quality assurance

The simulation software was extensively tested by some 25 participants including an external assessor over several months. The usual OU processes (see section 2.17) of editing, critical reading, and proof-reading were applied in the production phase. In the presentation phase, as is common in university courses, an independent evaluation is conducted (obtaining student and tutor feedback), and an external examiner reviews the academic standard of the course.

An evaluation of the first presentation (Price, 2003) suggested that students found the simulation motivating and very useful in enhancing their understanding. They strongly indicated that the simulation "fostered a great sense of community" and helped them "think reflexively on the relationship between theory and practice".

Students indicated in their feedback that in their decision to take the course in the first place, they were strongly attracted by the online nature of the course, and the emphasis on negotiation skills. A UN official taking the course was particularly impressed by the negotiation simulation. Two students commented how the negotiation skills they had acquired were being used in other aspects of their lives, and how empowered they felt by the course.

The students found none of the course topics (negotiation theory, international law, forests) difficult to study in the course. All the simulation sessions were rated as highly useful (more so than the print materials, in fact, which is unusual). Students indicated that they particularly valued the application of theory through the simulation as an effective learning strategy.

In the simulation, though, alliances between country "representatives" seemed to be formed on the basis of personalities rather than geopolitics. It is therefore an important role for the teaching materials and the tutor to encourage students to refine the scope of problems in an appropriate academic manner. There is also a potential danger in such simulations that students give priority to empirical data from the simulation rather than from wider research. In particular, realistic modelling of the power relations that exist between participants (e.g. access to resources, size of delegate team, the influence of lobby groups) is not built into the simulation. Again, then, this implies a role for the materials and tutor in focusing students' attention.

There were technical difficulties, and these seemed less to do with students' own system and more to do with their Internet connection or the Lyceum software. The Concept Map module and the Workload module were considered much less useful than the Document module.

In their feedback, students rated the assessment strategy highly, and indicated that the assignments were valuable for their learning, and the workload reasonable.

Business model

The aim was that the courses should be low cost and low maintenance. However, for certain aspects, especially the technology development of D833, it proved to be as costly as producing an undergraduate course. There was just one author for the course, including the software design, website and study guide. It took him over two years to produce. The other members of the course team were chairs of other courses in the Masters programme, and acted as Critical Readers and software testers for D833.

D833 represented a large financial investment by the Faculty. It was originally planned to be presented in May 2002 but there were insufficient student numbers, and so the first presentation was delayed until November 2002. The aim was for sixteen students for each of two simulations on the first presentation.

In the event, just seventeen students signed up in total. The OU's business model and scale of operations require large student numbers, usually in the hundreds or thousands, and D833 did not appear to be attracting the numbers of students needed to make the course viable. So, unfortunately, the course ran for only one presentation before being pulled on cost grounds.

Illustrating course design principles

D833 illustrates a number of points made earlier. It is a fifth-generation (online multimedia) course that uses a mix of technologies, mainly communication and presentation components, which have been tested and honed to minimise logistical problems. Training in the use of the technology is built into the course.

The course has a pedagogic approach based on active, experiential, social constructivist learning, and also provides opportunities for private reflection and student autonomy. One student observed in interview that they felt that the course was a good learning experience because they had to contribute, rather than simply attempting to absorb information.

D833 combines elements of resource-based learning (researching country profiles), collaborative learning (constructing a shared agreement), problem-based learning (how to achieve your country's goals), narrative-based learning (the use of the simulated UN forest negotiations as a central source). Its efforts to simulate authentic negotiations also suggest aspects of the community of practice idea, although it would only be by playing some of kind of role in a real negotiation that this concept could be properly realised.

The assessment strategy is integrated with the pedagogic strategy, combines formative and summative aspects, and takes careful account of what is known about the way students approach assessment.

Finally, the fate of D833 clearly illustrates the point made about the importance of the business model.

2.19 Concluding questions

It has been suggested in this section that there is no definitive evidence than online learning is superior to other methods, and that it is not necessarily a cheap option. Any advantages – relating, say, to the quality of the learning experience, economics or convenience – have to be established anew when key aspects of the educational aims or business model change. So those considering online learning should address questions such as:

- Who are the prospective students for this course?
- What are the educational aims of this course?
- Is the business model for this course sound?

It has also been argued that effective learning online requires a pragmatic mix of technologies, combining multiple opportunities for presentation, communication, and feedback. Serious consideration should be given to combining online and face-to-face learning ("blended learning"). So careful thought should be given to questions such as:

- What mix is appropriate for this course?
- Who is going to tutor on it?

Trends in pedagogic practice are away from rote learning towards more active learning, particularly involving discussion and collaboration. Skills in evaluating and applying knowledge are seen as particularly important; and hence learning in the

workplace rather than in detached courses is growing in importance. Course designers should ask themselves:

- What activities should students on this course experience?

It has also been suggested that findings from the psychological study of learning can provide insight, particularly in relation to topics such as motivation, memory, group dynamics, personality and identity. However, such "findings" are always produced in a specific context, and might not apply to this particular course. Crucial aspects of the context include the particular educational aims, students' prior knowledge in the domain, and how technologies are used.

- How did *you* learn what you know? How best might you learn it if you could take this course? Might other people learn it best in a different way?

"Learning dimensions" can help refine the philosophy of a course:

- *Individual versus social*: In this course, what should be the balance between private learning and group communication and collaboration?
- *Conditioning versus reflection*: In this course, what should be the balance between conditioning processes and reflection on experience?
- *Information versus experience*: In this course, what should be the balance between receiving information and practical activities?
- *Structure versus autonomy*: In this course, what should be the balance between expert guidance and self-directedness?
- *Generic versus personalised*: In this course, what should be the balance between differentiation by outcome and by task?

The report has also described some pedagogical approaches: resource-based learning, collaborative learning, problem-based learning, narrative-based learning and communities of practice.

- What combination of pedagogical approaches will be most effective on this course?
- Is the workload for course designer, tutors and students reasonable on this course?

Finally, attention must be given to appropriate assessment

- What assessment strategy would be suitable for these educational aims, student preferences, and pedagogical approaches? Does the strategy certify standards without over-assessment?

SUMMARY

- Course designers need to answer some tough questions, including:
  - Who are the students? Who are the tutors?
  - What the educational aims?
  - Is the business model sound?
  - What's the optimal mix of technologies, opportunities, pedagogical approaches, and assessment?

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3. How can ICT-based knowledge management strategies help C3D strengthen capacity?

SUMMARY

- Some kinds of learning might be more appropriate outside online courses. This section of the report considers how **ICT-based knowledge management strategies** can help build human capacity outside formal course settings and help build institutional capacity.
- The "**socio-cultural perspective**" considers the social context of learning.
- What opportunities might C3D be able to offer for learning through **authentic, collaborative activities within a community of practitioners**?
- **Communities of practice** have three characteristics: mutual engagement, joint enterprise and shared repertoire.
- **Community tools**, such the Open University's Knowledge Network, can support knowledge sharing processes in communities of practice.
- Computer systems supporting changing communities need to stay as **responsive and flexible** as possible.
- Communities can be helped by having **shared artefacts** such as a homepage, discussion space, document repository, search engine, and membership directory.
- Crucial questions for community tools are:
    - **Who can contribute** to the knowledge in the system?
    - **What happens to existing practices**?
    - **How is the community engaged** to participate in knowledge sharing?
- Two principles – "anyone can publish" and "let a hundred data sources bloom" – constitute a **distributed publishing model**.
- The key principles of the C3D project approach are learning by doing and learning by sharing. Encouragement of learning for innovation may require innovative approaches to learning.
- "**Learning organisations**" create opportunities for learning in everyday working activities.
- "**Competitive advantage**" refers to the unique blend of activities, assets,

relationships, history and market conditions that an organization exploits in order to differentiate itself from its competitors, and thus create value.

- The C3D centres have demonstrated one kind of competitive advantage by succeeding in obtaining funding.
- The C3D project aims to give developing countries a competitive advantage over developed countries in the UNFCCC process.
- How can the C3D centres build on their capabilities and existing competitive advantages to further their aims and those of the project?
- In order to strengthen the Community of Practice which consists of the C3D partners (ENDA, MIND, ERC, UNITAR, and OU), the project team might wish to consider the following questions:
    - What knowledge should the community be capturing?
    - How best can this knowledge be shared?
    - What are the financial, technological, administrative and logistical hurdles that each partner faces?
    - What can the community do to help?

3.1 Scope of this section

"Capacity building" is a commonly used phrase in the climate negotiations. It is a bundled and frequently fluidly negotiated concept that can on occasions mean everything to everyone. Unpacked, it often comprises the following elements:

- Human capacity building
- Institutional capacity building

Greater access to better quality information, education and training are critical elements of such capacity building. C3D is an attempt to build capacity, among other things, through education and training.

Section 2 of this report looked at the range of techniques that might be used within online courses to build human capacity. This section now considers the possibilities for using ICT-based knowledge management (KM) strategies to build human capacity outside formal course settings and to build institutional capacity.

How will ICT and distance learning choices affect the longer term results of the C3D project? To begin answering this question we need to look beyond specific issues relating to course design and pedagogies and consider the broader perspective in which choices are made. We need to take into account the strategies, goals, activities and outputs of the project, and map these against possibilities for knowledge management.

Specifically in this section of the report, we raise the following questions:

- Why are C3D participants already successful at what they do?

- What kinds of knowledge are involved in this success?
- How could this knowledge be shared with others?
- How can ICT help the C3D project team to build and conserve its intellectual assets in the long term?

This section considers a broader conception of learning by introducing some key ideas and strategies from the knowledge management literature, particularly relating to notions of "communities of practice", the "learning organisation", and "competitive advantage". These ideas and strategies are illustrated using case studies; and throughout this section we explore the applicability of the ideas and strategies to the context of the C3D partners.

3.2 A broader conception of learning

With respect to the C3D project, then, a "socio-cultural" perspective (see below) suggests that there can be more to strengthening capacity than just developing courses.

According to Thorpe, M. (2002), "In the 1980s, many assumed that training could be delivered via abstract texts and 'absorbed' remote from practice, with the assumption that effective practice can be learned in isolation and applied later." (p. 35). But recent ethnographic research has looked at learning outside formal educational settings. One particular focus has been on how people learn what they need for occupational purposes, without formal instruction. This research has identified the importance of "purpose and context in driving the learning process, and the large role that social interaction plays." (p. 32)

Rather than the social context being seen as extraneous "noise" in understanding learning, researchers now recognise that learning is 'situated' within its social context:

> "What people learn, as well as how, is the product of the context in which they learn, and of their social situation, as well as the overt content of their instruction." (*ibid*, p. 33)

In this perspective, knowledge is framed by the social relationships and understandings of individuals and communities, and cannot be abstracted from this social context with impoverishment. In particular, the roles of language, physical tools, the division of work, shared representations and the like are the subject of much scrutiny. This view of the social construction of reality challenges the transmission view of knowledge as a body of largely propositional content to be passed from the teacher to the student.

Thorpe gives an example of how this "social-cultural perspective" has provided insight into complex group tasks:

> "Hutchins… studied the way in which a team works together to navigate a ship (1995). Each person provides essential measurements and passes information to the pilot who takes decisions on the basis of their shared inputs, in order to steer the ship successfully, taking into account conditions on land, sea and underwater. The knowledge necessary to achieve the navigation process is distributed across the team, each one of whom must also understand the dynamics of the changes in the environment they are monitoring, and communicate them appropriately. The term 'distributed cognition' describes this phenomenon, where what must be achieved is so complex that a team or group has to be in place and able to work together as a unit. The key aspect is that the goal is impossible for an individual to achieve alone, and the outcome of the teamwork is greater than the mere sum of the parts played by each member. You will doubtless be able to think of other examples, such as landing a plane, or performing

> complex surgery, where each person carries some of the intellectual work required by a team acting as one in order to achieve their task." (p. 33)

Thorpe lists some examples of conclusions that have been drawn from such studies:

> - Learning needs to be based on authentic activity, i.e. the activity of practitioners in the communities that the learners seek to join.
> - Learning needs to be collaborative, i.e. to involve learners working together interdependently, to develop a shared perspective on knowledge and understanding of what is to be learned.
> - Learners need to have trust and confidence in each other – otherwise they will not share with or depend on each other.
> - Learners need to become a community – in order to identify with each other and thus be prepared to support the learning of colleagues as well as themselves.
> - Learners need access to expert communities – to have opportunities, albeit limited, for real interaction with real practitioners in the 'target' communities.
>
> *(ibid. p. 35)*

What opportunities might there be to learn through authentic, collaborative activities within a community of expert practitioners?

In developing the idea of communities of practice that integrate learning with working, Wenger (1998) describes such communities as having three characteristics – mutual engagement, joint enterprise and shared repertoire:

Mutual engagement: Individuals willingly engage in the shared task and membership of the community becomes part of their identity. Such engagement develops the individual's ability to function as an expert member of the community.

Joint enterprise: Members are mutually accountable to each other and negotiate the development of their practice. A team which has little control of its remit and functioning is not a community of practice.

Shared repertoire: Communities share vocabulary, routines, tools, stories, and so on that the community has created or adopted.

Communities of practice set the context in which new knowledge arises in daily work, and determine how it is shared and interpreted, what counts as important knowledge, and how people become recognized as members of that community.

Thorpe suggests, meanwhile, that, opposed to the "decontextualised versions of practice" that were seen in the 1980s, "The convergence of computing and telephony in multiple modes of interaction at a distance offers… a vital new context within which to foster 'learning in working', rather than learning abstracted from working." (*ibid.*). In other words, learning can be integrated with practice rather than pursued entirely independently of practice:

> Practitioners can have access to each other through online communities, not simply to 'repositories' of information, which promise much but have yet to deliver a great deal. In the fragmentation and pressure affecting many people's lives, asynchronous combined with synchronous modes of communication still offer advantages over face-to-face meetings at specific times and places.
>
> The delivery of all forms of resources and communication through one outlet, whether in the home or workplace/community, also offers new forms of accessibility for learners – particularly where efforts are made to use the technologies of flexible and accessible interfaces for learners with special needs. Practitioners can also link with others outside their immediate

> organisational boundaries, and give themselves new personal and occupational horizons that may also empower them, in terms of workplace line management arrangements. (*ibid*., p. 35)

How, then, might ICT-based knowledge management strategies help C3D to realize this vision of strengthening capacity through communities of practice?

SUMMARY

- Some kinds of learning might be more appropriate outside online courses. This section of the report considers how **ICT-based knowledge management strategies** can help build human capacity outside formal course settings and help build institutional capacity.
- The "**socio-cultural perspective**" considers the social context of learning.
- What opportunities might C3D be able to offer for learning through **authentic, collaborative activities within a community of practitioners**?
- **Communities of practice** have three characteristics: mutual engagement, joint enterprise and shared repertoire.
- How might **ICT-based knowledge management strategies** offer C3D opportunities to strengthen capacity?

3.3 Case study: The OU's Knowledge Network

The literature in the areas of knowledge management and communities of practice is vast, and applying concepts and analytical methods from these areas to the needs of the C3D partner organisations would be foolhardy without much more extensive resources than are available within the scope of the current project.

However, in order to explore how ICT-based knowledge management strategies might offer C3D opportunities to strengthen capacity, we offer a case study drawn from our own experience. The case study – of The Open University's Knowledge Network – illustrates how a "community tool" can help a number of knowledge management strategies.

The account of this case study draws heavily on McAndrew, Clow, Taylor & Aczel (2004).

Background

The Open University aims to provide the best possible learning experience for students. It has over thirty-five years experience to draw on, whilst as the same time new developments in technology and pedagogy continue. It is important, therefore, that staff are able to stay ahead in their field.

Given the quantity of information that the University has collected in the form of reports and papers, computing systems are an obvious support tool to help staff work their way through the resources. However, staff do not want only to obtain and read

formal documents; they also want to know what colleagues are currently thinking, what methods and approaches are currently being used; and they want the opportunity to discuss ideas with colleagues across the university. It can be difficult to arrange workshops or other face-to-face events at just the right moment to facilitate these needs.

In response to this situation, a team ("the KN team") was formed in 1999 to develop a Knowledge Network. The title was intended to be ambiguous—the software system itself was a network, as were the groups of people it was intended to support. The goal was to examine how individual members of staff could be supported in forming their own communities of practice through the use of software tools, but in situations where such communities had not yet gelled: the software itself was intended to catalyse the formation of the community. This means that requirements gathering was compromised: the Knowledge Network team did not know what the community would want, and neither did potential members. In any case, as a community forms and matures, goals might well change. The Knowledge Network team realised that if the system were to be accepted, they would have to stay as responsive and flexible as possible in order to convince users that their needs were paramount, rather than the needs of either the system itself, or the management concerns of the university.

Applying the communities of practice literature

Wenger, McDermott and Snyder (2002) encourage consideration of various tools that can be associated with a community of practice, as follows:

- a home page to assert their existence and describe their domain and activities;
- a conversation space for online discussions;
- a repository for their documents;
- a good search engine to find things in their knowledge base;
- a directory of membership with some information about members' areas of expertise in the domain;
- in some cases, a shared workspace for synchronous electronic collaboration, or to enhance teleconferences with visuals;
- community management tools, mostly for the coordinator, but sometimes also for the community at large (e.g. knowledge of who is participating actively, which documents are downloaded, which documents need updating, traffic flow, etc.).

However, it is important to recognise that "knowledge management" is not a stable, standardised set of deliberate, context-independent processes, each of which requires a support tool. Rather, a particular community's changing knowledge needs have to be met unobtrusively, without demanding atypical effort to learn how to use a tool or perform a task on-line. But even when knowledge management is well supported by standardised processes and systems, it will depend for its success on community-specific goals, resources and practices (Wasko & Faraj, 2000), which indicates a need for any system to stay flexible and responsive to users. This conclusion leads to evolutionary design processes, in which prototypes are developed, used in earnest, and improved iteratively.

Key questions for knowledge sharing

As the Knowledge Network team tried to identify what the needs of the community might be, it became clear that three key questions required attention:

1. Who can contribute to the knowledge in the system?
2. What happens to existing practices?
3. How is the community engaged to participate in knowledge sharing?

We examine these questions in turn.

1. Who can contribute?

The list of tools suggested by the Community of Practice literature includes many that potentially allow members of the community to contribute. It would seem obvious, and it seems to be a tacit assumption in the literature, that providing the widest possible opportunity for discussion, iteration and feedback would be best, but practical constraints can militate against this: discussions can lose focus, issues become attenuated with too many concerns, and so on. Furthermore, from an institutional perspective, there are potential risks in allowing anyone to contribute. Who would operate a quality assurance process for knowledge being circulated?

Nevertheless, the Knowledge Network development team took the decision that the system should provide a straightforward means by which *any member of the organisation* could publish materials and respond to material published by others, with no editorial control or moderation of contribution. This would also avoid the potential bottleneck that an approval process would necessarily impose, thereby enabling a more rapid build-up of resource.

This decision – "anyone can publish" – was in agreement with the principle that Knowledge Management tools only achieve high levels of acceptance, trust and productive usage if they fit easily into everyday working practices. It was also thought that the professional members of the community would have no difficulty in identifying weak material, and that it would simply drop out of circulation in due course.

2. What happens to existing practices?

Fundamental to the Community of Practice literature is a respect for the existing knowledge-sharing practices of a community. Obviously, if a set of tools is being introduced there must be some desire to enhance or change existing practices. The second key decision is the degree to which existing practices are supported or supplanted. Rather than seeking to supplant existing practices immediately, the development team decided to support existing practices in the organisation. This required a system that could search multiple websites and data sources simultaneously, to enable those who wished to share their data to do so according to the practices to which they were already accustomed. There were, therefore, no constraints on data sources in the system: information could be found from many sources.

These two decisions – "anyone can publish" and "let a hundred data sources bloom" – constitute a distributed publishing model.

3. How is the community engaged?

No matter how good a set of tools are, though, there is no guarantee that they will be spontaneously taken up and used by the community. The development team decided to follow the evolutionary design-and-test development process set out above in order to engage the community in the Knowledge Network, and its development. In parallel, time was set aside prior to the creation of the system for engaging particular communities in thinking about how they wanted to disseminate their work using electronic methods.

This "hearts-and-minds" work was aimed at ensuring that by the time the first full version of the system arrived, not only would the dissemination mechanisms have been shaped by the deliberation, but that the knowledge cultures of the various communities would have changed from one of hoarding (because 'knowledge is power') to one of sharing (because shared knowledge leads to better, more useful knowledge). This shift in knowledge culture was necessary if the strategy of distributed publishing was to work.

The community tool

We now look at the three facets of the system:

- **Database**: Providing OU staff with access to the University's experience of students, courses and educational technologies.
- **Publishing system**: Enabling OU staff and project partners to share what they have learned from teaching.
- **Collaboration tools**: Powering collaborative websites that enable teams to engage in teaching development or educational research.

Database

A clear need for communities was a database to provide easy access to what the organisation knows about the subject of interest (in this case, teaching and learning).

The tool used was a browser-based front-end to a database organised so that the database appears to be a single dataset to end-users, though the search engine is actually seamlessly searching a range of data sources behind the scenes. Furthermore, materials are automatically cross-referenced, so that users can see which other materials relate to the item they are viewing.

The database contains…

- case studies (in this case, of teaching innovations);
- statistical analysis of the organisation's performance (in this case, on student recruitment and progression);
- feedback from stakeholders (in this case, students, tutors, course designers, managers);
- reports on issues facing the organisation (in this case, widening participation, assessment, electronic conferencing, and the like);
- professional development activities and discussions;
- relevant news items and links, inside and outside the organisation.

Readers can…

- search the full text of every document;
- browse, filter and sort resources using the meta-data provided by authors;
- see related resources (inside and outside the organisation);
- comment on work-in-progress;
- subscribe to a resource, to receive an email notification when it is updated.

The "anyone can publish" decision enabled a rapid transfer of existing documents to the system, and coupled with the decision on supporting existing practices and the "hearts and minds" work resulted in a rapid take-up of this facility. A formative evaluation (Twining & Rico, 2002) found that the majority of users using the Knowledge Network were using it to locate documents. Moreover, this database function of the Knowledge Network appeared to constitute a large part of its perceived value: the study found that the Knowledge Network saved users' time looking for materials, helped them locate people with the knowledge they required, and helped them find information.

Within a year, around 20 per cent of OU staff were using the Knowledge Network; and within two years, around 40 cent of OU staff were using it. Interview evidence suggested that locating information was the main purpose of users as a whole, and that they were mainly successful. One of the respondents to the study said:

> The Knowledge Network is a useful way to find out what people in the OU have already found out about teaching issues, especially 'new' issues concerning, e.g. use of technology. A good place to find contacts, published reports and avoid 'reinventing the wheel'.

McAndrew et al (2004) suggest that that "despite it being much less glamorous than other e-learning tools, a shared database combining an uncomplicated, familiar interface with a powerful search engine and rich content is arguably one of the most useful knowledge management tools one can provide for motivated independent learners." (p. 743)

Publishing system

The Knowledge Network now contains over 1500 webpages and many thousands of documents. Some content is made available by searching a range of internal and external websites and database behind the scenes. But a lot of content is published by the authors themselves. Staff are encouraged to do this for themselves, and supported in doing so.

Motivations for sharing work are a complex area, much studied in the Knowledge Management literature. There are no easy answers. Within the OU, much of the publishing is done by groups who have a particular remit to disseminate their work within the university. In some cases, particular staff take on the responsibility of collating resources in relation to an issue of particular interest, or of interviewing members of a team and publishing summaries.

Some of the resources are commercial sensitive, copyrighted or insufficiently polished for external publication, and so are available only within the organisation (an "intranet"); other resources are made available more widely. The authors decide who can see what.

Authors can…

- publish their work (e.g. Word documents, PowerPoint slides, and video clips) to the OU Intranet or to the Web, without specialist skills;
- control access;
- invite comments on work-in-progress;
- receive access statistics;
- have work automatically cross-referenced with related resources.

How effective was the distributed publishing strategy in meeting knowledge sharing needs?

Participants in the evaluation a year after launch (Twining & Rico, 2002) consistently reported that the Knowledge Network helped them disseminate their work and to manage their own documents. “Early adopters” of the system might tend to be more tolerant, and more likely to be involved in publishing than other users, so an initial large overlap between publishers and readers was expected. Data from two years after launch suggests that this overlap had decreased.

Users who share materials interact with the subject matter in different ways. As was the case for access to materials via the database, it is clear that the various communities are not homogeneous. The department initially targeted for engagement with the system was responsible for the majority of the output; other communities provided smaller collections of data or individual reports. The system worked well to bring together different report series in one place, and to allow users to see the smaller, more diverse set of reports from other departments alongside the major report series.

The development of the Knowledge Network demonstrates that a distributed publishing strategy can enable staff to access knowledge that was previously hard to access. The evidence of benefits to staff themselves is less clear-cut, although, a priori, one would expect that simply working towards a goal of putting work into a form that can be shared with colleagues would have value and, more so, if discussions of that work follow. In any case, encouraging the sharing of knowledge must be seen as a crucial prerequisite of bringing about the learning organisation.

Collaboration tools

In addition to the database and publishing system, further tools were provided to staff and we now consider how the various communities exploited these tools.

The Knowledge Network provides technology for users to create collaborative web sites without technical knowledge. These websites can be private or public, and provide automatic navigation, automatic cross-referencing, discussions, bulletin boards, forms, search, access statistics, chat, audio-conferencing, video-conferencing, news, and subscriptions (receiving an email notification when the selected resource is updated). These community web sites were termed “KN workspaces”.

Members of project teams can publish and discuss their work, and then disseminate to a wider audience. The team has full control over the look-and-feel of their website, and can change the visual design and structure of all the pages with a few clicks.

So how effective were these collaborative workspaces in meeting knowledge needs?

Those participants in the evaluation study a year after launch who used the workspaces reported that their collaboration was supported. Overall, though, very few users used them and fewer than 10 per cent of all users contributed to discussions. An online questionnaire found that the vast majority of staff either did not know about or did not understand how to use collaborative workspaces. A training programme was started to help people understand the collaboration facilities and how they could be used to support their work.

In addition, a series of structured activities were created, to help engage the target population with issues in particular areas of strategic interest to the organisation. These blended face-to-face, self study, discussion and resource banks within a clear set of time-limited activities.

Meanwhile, several websites that had been previously independent of the Knowledge Network were moved to be hosted by these workspaces. This not only provided the benefits of more scaleable content management and of the collaboration facilities, but also introduced key users to the potential of the technology. Some of these web sites are public. For example, Knowledge Network technology powers a national library to support good practice in the re-use of educational software (RESL, www.resl.ac.uk), and the Humanities and Arts higher education Network (HAN, kn.open.ac.uk/workspace/han), with members in 160 institutions from 18 countries. It is also the platform selected by the University of Cambridge and MIT for the forthcoming UK-wide Knowledge Resource Network.

This effort increased the usage of the collaborative tools dramatically. Two years after launch, there were over 300 workspaces, 2,000 page impressions a week, and a user-base of about 7,000.

Evidence suggests that the communities are diverse, but that workspaces fall into one of the following types, with a few combining elements of more than one type:

- a shared private work area;
- a dissemination website;
- an authoritative overview of a topic;
- a learning activity.

What is common to all these types of workspace is that the extent of discussion and engagement in any given workspace is extremely variable, and that drivers to create the workspace tend to come from the users' own needs and motivations, rather than from the computer system itself.

Conclusion

This case study offers an illustration of the use of a software system to support knowledge sharing processes in communities of practice.

The experience suggests that the original design decisions, based upon the simple three-issue model, were sufficient to support communities of self-directed learners within an organisational context. The tools were found to be useful and uptake was surprisingly high given that the only incentive was the tool itself: there was no requirement for anyone to use the system.

The three key design questions were: Who can contribute resources to such a system? What happens to existing practices? How is the community engaged? These proved

sufficient to drive a development process, both in terms of software development, and in terms of the activities of the target users, that has resulted in a rich working environment to share knowledge and experience.

Interestingly, some groups within the organisation viewed the Knowledge Network as an anarchic threat to other new systems of document management. The very features that were most prized in the Knowledge Network (the ability for anyone to publish, the absence of editorial control, the freedom to exchange with many different kinds of staff) were seen as its biggest flaws. A considerable amount of the Knowledge Network team's time was spent in promoting the difference between the Knowledge Network and formal methods of document storage—the Knowledge Network team wanted to preserve the dynamic flexibility inherent in sharing, rather than construct a definitive body of knowledge that could be codified.

The characteristics that have enabled success are centred on ease-of-use and integration with an environment: the tools need to lower the barrier towards sharing rather than become an end in themselves. Of greater importance than the tools, though, is the link to patterns of working and the care with which the concepts are introduced.

Resisting organisational pressure to formalise the system and its processes also has demonstrated to the user community that the developers were anxious to respond to their actual needs, rather than impose methods on them. This has led to a sense of closer community amongst the groups using the system, and underlines the value of keeping tightly focused on the needs of the users.

McAndrew et al (2004) conclude that "knowledge management supported by a software environment offers a good way to bring together communities, resources and experience, but to achieve these benefits, great care needs to be exerted in introducing the system and maintaining existing work practices." (p. 739)

SUMMARY

- **Community tools**, such the Open University's Knowledge Network, can support knowledge sharing processes in communities of practice.
- Computer systems supporting changing communities need to stay as **responsive and flexible** as possible.
- Communities can be helped by having **shared artefacts** such as a homepage, discussion space, document repository, search engine, and membership directory.
- Crucial questions for community tools are:
    - **Who can contribute** to the knowledge in the system?
    - **What happens to existing practices**?
    - **How is the community engaged** to participate in knowledge sharing?
- Two principles – "anyone can publish" and "let a hundred data sources bloom" – constitute a **distributed publishing model**.
- How might such community tools be useful for building communities of practice in effective negotiation relating to climate change?

3.4 Mapping C3D's activities and outputs into a knowledge management framework

This section attempts to make connections between, on the one hand, C3D partners' activities and outputs, and, on the other, potential choices regarding ICT-based knowledge management styles and cultures and approaches to building learning organisations.

C3D objectives

The global objectives of C3D are listed in section 1 of this report. C3D's overall strategy is to first strengthen the centres' existing programs, and then to launch new initiatives to build human and institutional capacity in the regions.

Key operating principles for the project (as listed on page 2 of UNITAR's short description of the project) include:

- Learning by sharing
- Learning by doing
- Promoting intra-regional cooperation
- Disseminating experiences and case studies
- Prioritising key information

A list of project activities includes:

- Provide support to government and non-government organisations on topics relating to all aspects of the sustainable-development-climate change nexus
- Special focus on sensitising and training key decision makers in areas of the science of climate change, its impacts, adaptation, mitigation and related policy decision-making
- Systematically seeking to build capacity in other national focal points and centres in the region using existing networks of partners
- Informing and raising awareness among key public and private decision makers about the UNFCCC process and CC-SD linkages and priority issues
- Offering structured training programs to target sectors and institutions
- Promoting regional policy dialogues
- Providing coaching and advice to key decision makers and negotiators on key issues on request
- Developing and disseminating policy, technical, analytic and training tools
- Structuring and tailoring training programs for national focal points centres, sectors and economic actors
- Policy research, best practice examples and dialogue

Key outputs of the C3D project include:

- Updated/New pedagogic materials
- Training tools
- Needs assessment exercises and reports
- Six week intensive “training of trainers” program
- Electronic/virtual network
- Desk study on distance learning
- Business plan (to ensure the sustainability of the project’s achievements beyond its duration) and fund raising

Important elements of this work include:

- Designing, managing and implementing training programmes on an ongoing basis.
- Reducing dependence on institutes based in industrialised countries for skills building and capacity development.
- Making 10-20 trainers available in each centre, all having gone through an intensive training course developed, designed and implemented by the project

The global objectives of the C3D project translated into practical knowledge management matters are sketched out in Table 3.1. A glossary of terms relating to knowledge management follows the table.

Table 4: Mapping linkages between C3D objectives, activities and ICT/KM choices

C3D objective	Related activities	ICT/KM linkages (see glossary below)
An improved participation of developing countries (non-Annex I Parties) in the UNFCCC process (particularly LDCs from Africa and Asia)	Special focus on sensitising and training key decision makers in areas of the science of climate change, its impacts, adaptation, mitigation and related policy decision-making Providing coaching and advice to key decision makers and negotiators on key issues on request	Knowledge mapping Knowledge sharing culture Best practice resource map Competence and learning activities
A timely implementation of the UNFCCC and Kyoto Protocol by developing countries	Systematically seeking to build capacity in other national focal points and centres in the region using existing networks of partners Promoting regional policy dialogues Developing and disseminating policy, technical, analytic and training tools Policy research, best practice examples and dialogue	Intangible assets monitor Expertise directory Communities of practice
A better co-ordination & integration of national climate policies with sustainable development policies	Provide support to government and non-government organisations on topics relating to all aspects of the sustainable-development-climate change nexus Informing and raising awareness among key public and private decision makers about the UNFCCC process and CC-SD linkages and priority issues Offering structured training programs to target sectors and institutions Structuring and tailoring training programs for national focal points centres, sectors and economic actors	Intelligence Network Best practice sharing Collaborative workspace

Glossary of knowledge management terms

Best practice

Methods of performing a process identified inside or outside the organization and which are validated, codified, diffused, and shared with others to encourage reciprocity and knowledge sharing.

Communities of practice

A self-organized, deliberate collaboration of people who share common practices, interests or aims and want to advance their knowledge. When the community proves useful to its members over time, they may formalize their status by adopting a group name and a regular system of interchange.

Collaborative working

A generic term that simply means teamwork or a group effort. It also has a more specific meaning in knowledge management, where it is often used to describe close working relationships involving the sharing of knowledge.

Expertise directory

A staff directory in the form of a database that includes details of people's skills, knowledge, experience and expertise so that users can search for people with specific know-how.

Explicit knowledge

Knowledge that can be easily expressed in words or numbers, and can be shared through discussion or by writing it down and putting it into documents, manuals or databases. Examples might include a telephone directory, an instruction manual, or a report of research findings.

Groupware

Computer software applications that are linked together by networks, and so allow people to work together and share electronic communications and documents.

Information audit

A method of reviewing and mapping information in an organisation. An information audit looks at things like what information is needed, what information there currently is, where it is, in what forms, how it flows around the organisation, where there are gaps and where there is duplication, how much is it costing, what its value is, how it is used etc.

Intangible Assets monitor

The Intangible Assets Monitor is a method for measuring intangible assets and a presentation format which displays a number of relevant indicators for measuring intangible Assets in a simple fashion. The choice of indicators depends on the company strategy

Intellectual assets

Those parts of an organisation's intangible assets that relate specifically to knowledge, such as know-how, best practices, intellectual property and the like. Intellectual assets are often divided into human (people, teams, networks and communities), structural (the codified knowledge that can be found in processes and procedures) and technological (the technologies that support knowledge sharing such as databases and intranets). By understanding the intellectual assets an organisation possesses, the organisation can improve its ability to use them to best effect and also to spot any gaps that may exist.

Intelligence Network

Intelligence Network locates, gathers, analyzes and distributes value-added information to enhance competitiveness and help its decision-makers develop forward-looking strategies. Intelligence gathering is done constantly, with a long-term perspective. It covers a variety of major topics.

Knowledge audit

A method of reviewing and mapping knowledge in an organisation including an analysis of knowledge needs, resources, flows, gaps, users and uses.

Knowledge mapping

A process to determine where knowledge assets are in an organisation, and how knowledge flows operate in the organisation. Evaluating relationships between holders of knowledge will then illustrate the sources, flows, limitations, and losses of knowledge that can be expected to occur.

Knowledge repository

A place to store and retrieve explicit knowledge. A low-tech knowledge repository could be a set of file folders. A high-tech knowledge repository might be based on a database platform.

Learning organisation

An organisation that views its success in the future as being based on continuous learning and adaptive behaviour. It therefore becomes skilled at creating, acquiring, interpreting and retaining knowledge and then modifying its behaviour to reflect new knowledge and insights.

Organisational culture

In short, 'the way we do things around here'. An organisation's culture is a mixture of its traditions, values, attitudes and behaviours. Different organisations can have very different cultures. In knowledge management, an organisation's culture is extremely important - if it is not based on qualities such as trust and openness, then knowledge management initiatives are unlikely to succeed.

SUMMARY

- Knowledge management concepts can be usefully applied to the context of the C3D project. This task is beyond the remit of the OU's contribution at this time. So project partners need to consider the issues themselves. In the remaining sections of this report, we offer some further avenues to explore.

3.5 C3D as a learning organisation

The Learning Organisation is a concept that is becoming an increasingly widespread philosophy in modern organisations, from the largest multinationals to the smallest ventures including not for profit organisations.

What is achieved by this philosophy depends considerably on one's interpretation of it and commitment to it.

Peter Senge (1990) defines the learning organisation as follows:

> "An organisation in which people continually expand their capacity to create the results they truly desire, where new and expansive patterns are nurtured, where collective aspiration is set free and where people are continually learning how to learn together"

In discussing the elements necessary for the learning organisation to evolve, he emphasises the crucial role of team learning: "unless teams can learn, the organisation cannot learn."

Perhaps more significantly, as far as the C3D project is concerned, the growing interest in the learning organization in the 1990s alerted many of those concerned with organizational development to the significance of informal networks and groupings. The concept of communities of practice offers a useful addition. It allows proponents to argue that communities of practice as C3D need to be recognized as valuable assets.

So in what ways can ICT-based knowledge management strategies help C3D to create "learning organisations"?

Acknowledging that communities of practice affect performance is important in part because of their potential to overcome the inherent problems of a slow-moving traditional hierarchy in a fast-moving virtual economy. Communities also appear to be an effective way for organizations to handle unstructured problems and to share knowledge outside of the traditional structural boundaries. In addition, the community concept is acknowledged to be a means of developing and maintaining long-term organizational memory.

It is worth emphasizing that neither Communities of Practice nor the larger Knowledge Management initiatives are driven by technology. Although it is true that technology can enable and support a wide variety of Knowledge Management initiatives, Knowledge Management should not be equated with technology. People create and apply knowledge. This is especially true of Communities of Practice.

A community of practice is different from a network in the sense that it is "about" something; it is not just a set of relationships. It has an identity as a community, and thus shapes the identities of its members. A community of practice exists because it produces a shared practice as members engage in a collective process of learning.

Communities are like the hidden engine that keeps an organisation creative and competitive. However, they are a fragile structure based principally on the spontaneous, voluntary and informal efforts of their participants. An organisation's ability to learn - meaning it can create, produce value, innovate and remain competitive - on a continuous basis is affected by its informal information exchanges. The secret to successful knowledge management and facilitating informal information exchange is all about nurturing and sustaining communities of practice. In other words work needs to become more collaborative.

In the 1980's, companies discovered time as a new source of competitive advantage. This lead to *capabilities-based competition* including the capability of learning. Becoming a Learning Organisation seems a logical step for all companies to follow.

Awareness

Organisations must be aware that learning is necessary before they can develop into a Learning Organisation. This may seem to be a strange statement but this learning must take place at all levels; not just the Management level. Once the organisation has accepted the need for change, it is then responsible for creating the appropriate environment for this change to occur in.

Environment

Centralised, mechanistic structures do not create a good environment. Individuals do not have a comprehensive picture of the whole organisation and its goals. This causes political systems that stifle the learning process. Therefore a more flexible, organic structure must be formed. By organic it is meant a flatter structure, which encourages innovations. The flatter structure also promotes passing of information between workers and so creating a more informed work force.

It is necessary for management to take on a new philosophy in order to encourage openness, reflectivity and accept error and uncertainty. Members need to be able to question decisions without the fear of reprimand. This questioning can often highlight problems at an early stage and reduce time consuming errors.

Leadership

Leaders should foster the Systems Thinking concept and encourage learning to help both the individual and organisation in learning. It is the leader's responsibility to help restructure the individual views of team members. For example, they need to help the teams understand that competition is a form of learning not a hostile act.

Management must provide commitment for long-term learning in the form of resources. The amount of resources available (money, personnel and time) determines the quantity and quality of learning. This means that the organisation must be prepared to support this.

Empowerment

The locus of control shifts from managers to workers. This is where the term Empowerment is introduced. The workers become responsible for their actions; but the managers do not lose their involvement. They still need to encourage and co-ordinate the workers. Equal participation must be allowed at all levels so that members can learn from each other simultaneously. This is unlike traditional learning that involves a top-down structure (classroom-type example) that is time consuming.

Learning

Companies can learn to achieve these aims in Learning Labs (e.g. Lyceum and D833 at the Open University, as described in Thorpe, K. (2002) in section 2 of this report). These are small-scale models of real-life settings where management teams learn how to learn together through simulation games. They need to find out what failure is like so that they can learn from their mistakes in the future. These managers are then responsible for setting up an open, flexible atmosphere in their organisations to encourage their workers to follow their learning example.

Any organisation that wants to implement a learning organisation philosophy requires an overall strategy with clear, well-defined goals. Once these have been established, the tools needed to facilitate the strategy must be identified.

There are five disciplines (Peter Senge, 1990) that are essential to a learning organisation and should be encouraged at all times. These are Team Learning, Shared Visions, Mental Models, Personal Mastery and Systems Thinking.

Team learning

Virtually all-important decisions occur in groups. Teams, not individuals, are the fundamental learning units. Unless a team can learn, the organisation cannot learn. Team learning focuses on the learning ability of the group. Adults learn best from each other, by reflecting on how they are addressing problems, questioning assumptions, and receiving feedback from their team and from their results. With team learning, the learning ability of the group becomes greater than the learning ability of any individual in the group.

Shared visions

To create a shared vision, large numbers of people within the organisation must draft it, empowering them to create a single image of the future. All members of the organisation must understand, share and contribute to the vision for it to become reality. With a shared vision, people will do things because they want to, not because they have to.

Mental models

Each individual has an internal image of the world, with deeply ingrained assumptions. Individuals will act according to the mental model that they subconsciously hold, not according to the theories that they claim to believe. If team members can constructively challenge each others' ideas and assumptions, they can begin to perceive their mental

models, and to change these to create a shared mental model for the team. This is important as the individual's mental model will control what they think can or cannot be done.

Personal mastery

Personal mastery is the process of continually clarifying and deepening an individual's personal vision. This is a matter of personal choice for the individual and involves continually assessing the gap between their current and desired proficiencies in an objective manner, and practising and refining skills until they are internalised. This develops self-esteem and creates the confidence to tackle new challenges.

Systems thinking

The cornerstone of any learning organisation is the fifth discipline - systems thinking. This is the ability to see the bigger picture, to look at the interrelationships of a system as opposed to simple cause-effect chains, allowing continuous processes to be studied rather than single snapshots. The fifth discipline shows that the essential properties of a system are not determined by the sum of its parts but by the process of interactions between those parts.

Systems thinking are fundamental to any learning organisation; without systems thinking each of the disciplines would be isolated and therefore not achieve their objective. The fifth discipline integrates them to form the whole system, a system whose properties exceed the sum of its parts. However, the converse is also true - systems thinking cannot be achieved without the other core disciplines: personal mastery, team learning, mental models and shared vision. All of these disciplines are needed to successfully implement systems thinking, again illustrating the principal of the fifth discipline: systems should be viewed as interrelationships rather than isolated parts.

Anglian Water

Anglian Water Services is an example of a company that has explicitly embraced the aim of becoming a learning organisation as part of its mission statement.

In 1993/94 the company viewed it as essential that they should change from being local to a global supplier within the industry, growing the business to export knowledge and expertise internationally. This would require the organisation to operate the business in a different way, moving from functional bureaucracy to something more akin to a learning organisation.

Its initiative includes: the development of an “encyclopaedia of water” – a database containing business information, reports and knowledge culled from books, articles, manuals and so on about water technology. It is also seeking to capture tacit knowledge of workers who are about to leave the company by challenging them to run master classes and these are entered into the encyclopaedia.

In addition, there is the company university with its open learning centres and other resources. It encourages collaboration with external institutions, especially higher education establishments.

The University of Water was initially launched in 1994. Although Anglian Water had always placed great emphasis on training, they began to question the relevance of training by itself. It was therefore decided to bring all existing training programmes under one umbrella of learning and ‘knowledge management architecture’. This emphasised on transferable skills such as knowledge creation based on existing experience and the transfer of that knowledge. The aim is to create an outstanding workforce with the necessary skills to cope with constant change and evaluation.

Further information and details on Learning Organisations can be found at http://www.infed.org/thinkers/senge.htm

Why Learning Organisations work

1. People Develop: a Learning Organisation encourages its members to improve their personal skills and qualities, so that they can learn and develop. They benefit from their own and other people's experience, whether it be positive or negative.

2. Greater motivation: People are appreciated for their own skills, values and work. All opinions are treated equally and with respect. By being aware of their role and importance in the whole organisation, the workers are more motivated to "add their bit". This encourages creativity and free-thinking, hence leading to novel solutions to problems. All in all there is an increase in job satisfaction.

3. The workforce is more flexible: people learn skills and acquire knowledge beyond their specific job requirements. This enables them to appreciate or perform other roles and tasks. Flexibility allows workers to move freely within the organisation, whilst at the same time it removes the barriers associated with a rigidly structured organisation. It also ensures that any individual will be able to cope rapidly with a changing environment, such as those that exist in modern times.

4. People are more creative: there are more opportunities to be creative in a learning organisation. There is also room for trying out new ideas without having to worry about mistakes. Employees' creative contribution is recognised and new ideas are free to flourish.

5. Improved social interaction: learning requires social interaction and interpersonal communication skills. An organisation based on learning will ensure members become better at these activities. Teams will work better as a result.

6. Teams and Groups Work Better: learning Organisations provide the perfect environment for high performing teams to learn, grow and develop.

Knowledge sharing

Openness Creates Trust: A team is composed of highly specialised members who cannot and are not expected to know everything about a job. In this case the sharing of common knowledge is quite important for the completion of a job. Within learning organisations in general, and teams in particular, information and knowledge flows around more freely. This makes for higher productivity within teams and between teams as they build on each others' strengths. Trust between team members increases and hence they value each other opinions more.

Interdependency: in any organisation people depend on each other for the completion of their jobs. Learning Organisations will increase this awareness, and improve relations between people at a personal level. By knowing more about other people's roles, needs and tasks, members can manage their time better and plan their work more efficiently. This dependency is decreased as learning is enhanced, letting people get on with their own job better as they rely less on others.

Organisational benefits

An active learning organisation will have at its heart the concept of continuous learning. Therefore it will always be improving in its techniques, methods and technology.

Breakdown of traditional communication barriers: the old hierarchical communication barrier between manager-workers has devolved into more of a coach-team member scenario. Leaders support the team, not dictate to it.

All workers have an increased awareness of the organisation's status, and all that goes on in other departments. Communication between and across all layers of the organisation gives a sense of coherence, making each individual a vital part of the whole system. Workers perform better as they feel more a part of the organisation.

Information resources: over time an organisation builds up a pool of learning, in the form of libraries, and human expertise. This pool of knowledge within learning organisations is larger than average. New problems and challenges can be met faster using this increased resource.

Innovation and creativity: as more people in every level of an organisation engage in continual learning a valid contribution can come from any member of the organisation, and from any part of the organisation. Being innovative and creative is the responsibility of the whole workforce and allows learning organisations to adapt to changes in the state of the market, technology and competition efficiently.

Moreover, this creativity gives rise to an increased synergy. The interaction between high performing teams produces a result that is higher than was planned or expected of them.

Characteristics of Learning Organisations

Table 5 provides a summary of the characteristics of learning organisations. In what ways can ICT-based knowledge management strategies help the C3D project as a whole and the partner institutes to create “learning organisations”?

Factor	Questions	Which issue does the question tackle?
Learning culture	Is learning continuous?	General statement about the climate for learning, how do staff perceive the organisational culture?
	Is knowledge sharing valued?	Rewarding knowledge sharing; positive incentives
	Does the company culture support learning?	Job satisfaction; general statement about the climate for learning
	Are all individuals valued for their contribution to the organisation?	Compensation systems, meritocracy, fairness
	Is time taken to reflect on past failure and successes?	Reflection-oriented organisational culture, continuous improvement efforts
	Do managers learn from other managers/organisations through workshops, benchmarking, and informal meetings?	Management actions towards building a learning organisation; management's actions in the eyes of the employees, business routines and supporting processes
Processes	Is responsibility shared between management and staff?	Empowerment, climate of openness, participation in the decision-making process
	Is knowledge shared between employees regularly?	Horizontal knowledge sharing; breaking down of organisational silos
Tools and techniques	Is it only managers who know about the finances?	Transparency of managerial decisions; trust building
	Does the organisation support linking of people from within and from outside? (Networking, *know-who* type of knowledge)	Management actions towards building a learning organisation
	Are innovative and creative ideas and suggestions presented in official meetings occasionally criticised by the management?	Staff satisfaction with management; management's 'acid test' for the learning organisation business culture
Skills and motivation	Does hoarding of knowledge mean power?	Negative characteristics of a non-learning organisation
	Are staff encouraged to take risks with new ideas?	Cultivating entrepreneurial spirit; management's approach towards failures
	Are staff encouraged to think critically?	Thinking outside the box; staff satisfaction with management

Table 5: Characteristics of learning organisations

SUMMARY

- The key principles of C3D project approach are learning by doing and learning by sharing. Encouragement of learning for innovation may require innovative approaches to learning.
- Learning organisations create opportunities for learning in everyday working activities.
- In what ways can ICT-based knowledge management strategies help the C3D project as a whole and/or the partner institutes to create “learning organisations”?

3.6 The concept of competitive advantage

Why are C3D participants already successful at what they do?

One of the key principles in C3D project is “prioritising key information”. Knowing why some information is important, when it is relevant, where it can be found, who possesses it and how to obtain it and translate it into useful knowledge is a key source of C3D partners’ “competitive advantage”.

We begin with a glossary of terms relating to the concept of competitive advantage.

Glossary of terms relating to competitive advantage

Appropriability

The extent to which something can be imitated. Things are said to have "strong" appropriability if they are difficult to reproduce by another organization. The converse is "weak" appropriability.

Competitive advantage

A widely-used term to describe the unique blend of activities, assets, relationships, history and market conditions that an organization exploits in order to differentiate itself from its competitors, and thus create value.

Double-loop learning

People fundamentally reshape their patterns of thinking with the intent of helping them learn to do different things. Double-loop learning questions existing assumptions in order to create new insights. For example, take the problem 'how do we prevent earthquakes from killing people?’ The single-loop answer would be to learn how earthquakes happen and try to predict them in order to be prepared. The double-loop answer would question our notion of 'earthquake' and might conclude that earthquakes do not kill people, falling buildings do.

Intangible assets

The non-physical resources of an organisation. An example might be the reputation linked to a brand name or the loyalty of customers to a company. These assets are not generally accounted for in an organisation's financial statements, but they are of great value to the organisation.

Single-loop learning

Single-loop learning involves using knowledge to solve specific problems based on existing assumptions, and often based on what has worked in the past.

The competitive advantages of the C3D centres

There are two senses in which the term “competitive advantage” is used with reference to the C3D project.

In one sense, the C3D centres have demonstrated their competitive advantage by succeeding in obtaining funding.

In another sense, the C3D project aims to give developing countries a competitive advantage over developed countries in relation to training and capacity building within the UNFCCC process.

The framework for capacity building in developing countries contained in UNFCCC Decision 2/CP.7 stresses the importance of mobilising existing institutions in developing countries and building on existing processes and endogenous capacities at the regional, national and local levels.

While the C3D partner institutions are participating in the project precisely because they need to be strengthened, they are nonetheless already examples of successful learning organisations that have the ability to manage different kinds of knowledge strategically to pursue a number of objectives.

The partner organisations and contexts are very different from each other:

MIND is a relatively small organisation in Sri Lanka. It employs around 10 people including a number of research students. Its central goal is to make development more sustainable by initiating research programs, promoting intellectual activities, and undertaking projects in relevant fields, including engineering, life, physical, and social sciences. As its name suggests, central to its success is the experience, expertise and knowledge of its Chairman Prof. Mohan Munasinghe. MIND has very good connections and exchanges with universities around the world including Europe and North America.

ENDA is a large multifaceted organisation based in Senegal. Founded in 1972, ENDA covers a large range of topics at the nexus of environment and development. The organisation stresses a “grassroots” approach to achieving its objectives. It may already be that ENDA has formally considered knowledge management issues and will have its own cultural approach to understanding knowledge management, networking and communication.

ERC is a university research centre at the University of Cape Town. Though it is a research centre, it also supports some Masters level teaching. It is therefore the closest of

the three centres in a formal sense to the world of higher education and its methods for using ICTs. “The Energy Research Centre (ERC) is a University-based research centre committed to high quality, targeted and useful research. It comprises over 20 researchers in the fields of engineering, science and social sciences and is supported by administrative staff and postgraduate students. The ERC fulfils an education and training role for the energy sector in Africa, with the Masters programme in Energy and Development being one such role.

All three organisations operate in a context where there is a degree of competition for scarce resources. They each have unique sources of competitive advantage. An explicit assessment of the sources of success among the partners may help ensure greater long-term sustainability for the C3D project.

Competitive advantage may come from or through faster learning, sustained innovation, or a unique blend of technology and practice. Knowledge Management can play a central role in all these aspects. The key is having a shared understanding within the organisation of exactly what aspects of knowledge are important, opening communications to take advantage of news and insights and having a culture that allows failure, learns from mistakes and appreciates the fundamental role of knowledge as a strategic driver in the current economy.

Some questions around competitive advantage the C3D partners might ask themselves:

- Where are you trying to get to in the long-term? (direction)
- Which markets do you want to compete in and what kinds of activities are involved in such markets? (markets; scope)
- How can you do better than the competition in those markets? (advantage)
- What resources (skills, assets, finance, relationships, technical competence, facilities) do you need in order to be able to compete? (resources)
- What external, environmental factors affect your ability to compete? (environment)
- What are the values and expectations of those who have power in and around the organisation? (stakeholders)

Capabilities

The human and institutional dimensions of capacity building can be unpacked in terms of different sorts of “capabilities”.

The most important capabilities arise from the integration of individual functional capabilities. Capabilities are needed to build and maintain the internal resources (whether tangible resources such a money or equipment, or intangible resources such as know-how or reputation) and to manage and secure cross-boundary access to external resources.

A distinctive capability can be a pool of knowledge in an organisation, which can be used to reduce the cost or time required creating a new resource or extending a new one (Grant, 1995). People are often the embodiment (Blackler 1995) of distinctive capabilities, so the balance of power between the individual and the organisation needs to

be managed in order to prevent a distinctive capability from suddenly being lost. The organisation might also need to increase absorptive capacity.

Kay (1993) suggests that there are three types of distinctive capabilities: Architecture (formal and informal relationships), reputation and innovation. Pools of cumulative experience, knowledge and systems, can be used to create a new resource or extend an existing one.

Owning competitive advantage

Every organisation can own one or several competitive advantages - the difficulty is figuring out what they are. Market leading companies have figured out the importance of owning their competitive advantage in order to get to market fast and to sustain speed.

Cross-functional excellence

Although innovation is driven by technology, required competence extends beyond technical know-how. In the new knowledge economy and knowledge-based enterprises, systemic innovative solutions arise from complex interactions between many individuals, organizations and environmental factors. The boundaries between products and services fade rapidly too. It is vital to be able to integrate in a balanced way different types of know-how that would transform stand-alone technologies, products and services into a seamless, value-rich solution.

Corporate culture as a fundamental competitive advantage

The strength of the organization's culture is one of the most fundamental competitive advantages. Build and preserve an innovation-adept culture, a culture of commitment, where employees passionately pursue the organisation's cause and mission can help to be better positioned for success.

People as the main source of competitive advantage

Competitors can copy technologies, products and structures. No one, however, can match highly charged, motivated people who care. People are the organisation's most important asset and, at the same time, its most under-utilised resource. People are the organisation’s repository of knowledge and skill base that makes the organisation competitive. Well coached, and highly motivated people are critical to the development and execution of strategies, especially in today's faster-paced, more perplexing world, where top management alone can no longer assure the organisation’s competitiveness.

Leveraging the power of knowledge

Market champions keep learning how to do things better, and keep spreading that knowledge throughout their organization. Learning provides the catalyst and the intellectual resource to create a sustainable competitive advantage. Organizations obtain competitive advantage from continuous learning, both individual and collective. Learning by the people within an organization becomes learning by the organization itself. The

changes in people's attitudes are reflected in changes in the formal and informal rules that govern the organization's behaviour

Tacit knowledge as a source of sustainable competitive advantage

All knowledge isn't the same. There is explicit knowledge - the kind that can be easily written down (for example, patents, formulas). The explicit knowledge can create competitive advantage, but its half-life is increasingly brief, as others can replicate it easily.

Tacit knowledge is far less tangible and is deeply embedded into an organization's operating practices. It is often called 'organizational culture'. "Tacit knowledge includes relationships, norms, values, and standard operating procedures. Because tacit knowledge is much harder to detail, copy, and distribute, it can be a sustainable source of competitive advantage"

Shell – Knowledge Management Insights
In the 1990s, the Royal Dutch/Shell Group of companies used a simple and popular approach to facilitate knowledge transfer: multi-disciplinary teams. Learning communities were established; these communities were built around topics important to business and community members. This approach to organizational structure has often proven most valuable in providing cross-functional collaboration.
They also discovered that knowledge management is a practice that requires constant vigilance and redefinition. Recognizing that teams needed some structure in order to facilitate knowledge communication. But also recognizing that that the specific knowledge needs of each team would be different, each community was given the autonomy to create their own standards for capturing and sharing knowledge. Additionally a knowledge community infrastructure team (KNIT) was formed to provide guidance and support of the knowledge management effort on each learning community and asset team.
Technology was properly viewed and instituted as an augmenter to the knowledge management practice, not the practice itself. As part of the cultural change to a more knowledge-sharing environment, Shell understood the value of providing autonomy and a spirit of entrepreneurship. While basic rules were provided, teams and communities were empowered to determine their fate, the approaches required, the level of knowledge needed, etc.
Shell discovered also, after its early attempts at knowledge-based teams, without boundaries and definitions people flounder. Knowledge may be personal but to bring any order to it, guidelines must be provided as to the level of detail that should be captured, when it should be captured and how to value it.

Here are some examples of best practice:

1. Information transfer: The capture and distribution of explicit information via groupware, file sharing, intranets, or building a corporate repository. Have a process in place to validate and abstract the case histories, connect to people as well as content, provide feedback.

2. Measure & market intellectual capital & knowledge assets: mine transaction data streams for patterns and useful business rules, establish a database to sequence and manage all forms of intellectual capital (patents, trademarks, copyright, brand value)

3. Competitive intelligence: gather and increase awareness of markets, environment and competitors, establish single target profiles and encourage all staff to contribute, push items to individuals depending on activities & roles

4. Community learning: establish and support communities of practice, monitor practice networks for excessive knowledge leaks, start a program of intentional knowledge communities to help with learning and agility.

5. A total knowledge focus: extend best practices to customers and suppliers, use relationship audits to target possible alliances, search for knowledge related opportunities in products, services and supply chain, involve all stakeholders in the knowledge strategy.

SUMMARY

- "**Competitive advantage**" refers to the unique blend of activities, assets, relationships, history and market conditions that an organization exploits in order to differentiate itself from its competitors, and thus create value.
- The C3D centres have demonstrated one kind of competitive advantage by succeeding in obtaining funding.
- The C3D project aims to give developing countries a competitive advantage over developed countries in the UNFCCC process.
- How can the C3D centres build on their capabilities and existing competitive advantages to further their aims and those of the project?

3.7 Towards a shared vision of knowledge management for C3D

Knowledge management promotes practices and technologies that facilitate the efficient creation and exchange of knowledge within communities of practice.

The C3D project is much more than another organisation launching its latest new website, a new clearinghouse, or database. The sort of capacity it is designed to build is much wider and deeper than that.

There is a great deal of literature on organisations and knowledge management. Much of it deals with private sector organisations; but there is very little that is directly relevant to the particular sorts of organisations involved in C3D and the particular contexts in which they find themselves.

Beyond the fabric of the CERN platform to share information, the long term sustainability and business health of the project may be strengthened by arriving at an explicit and shared vision of C3D's unique culture of knowledge management.

Xerox, for example, conceive knowledge management as being about creating a thriving work and learning environment that fosters continuous creation, aggregation, use and re-use of organizational and personal knowledge in the pursuit of new business value.

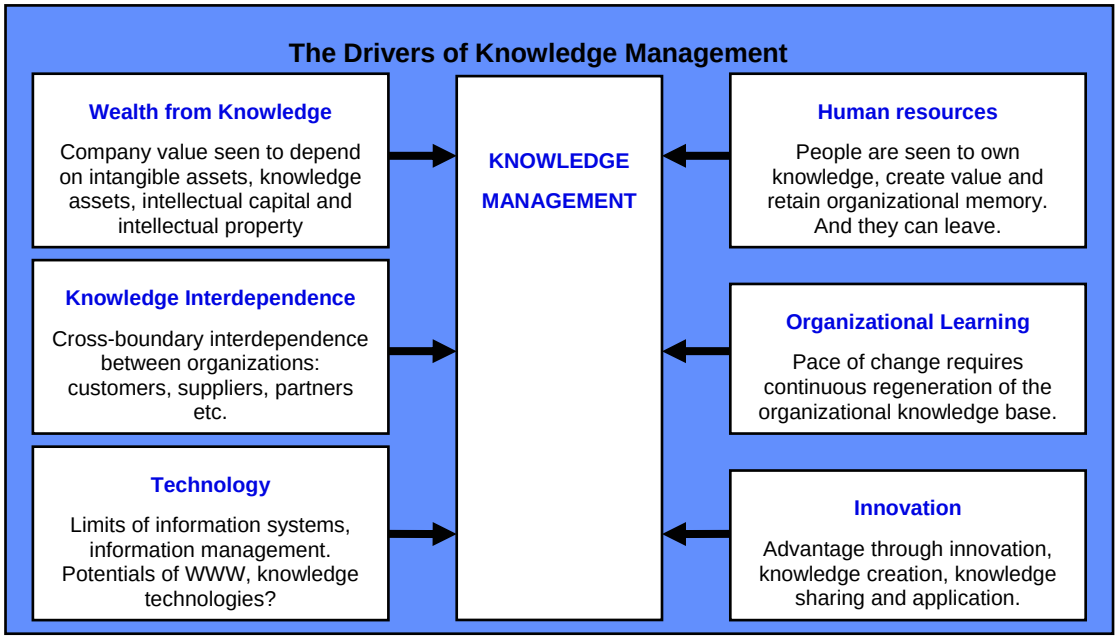

Figure 14: Typical private sector view of the drivers of Knowledge Management (source: OUBS)

Knowledge management is about

- organizational memory
- intellectual content of products
- combining knowledge through teamwork
- learning from stakeholders
- embedded in intellectual property rights

The effects of ICTs on cultures of knowledge management have been two-fold. In some sectors communication technologies have dispersed power and control, leading to disaggregation and empowerment, in others they have clearly led to centralisation and concentration.

How might C3D look 5 years from now in terms of knowledge management? Here are three alternative scenarios of what might happen. The scenarios are caricatures, and not based on any kind of formal analysis (which is possible to do, but beyond the remit of the OU at this time). Nevertheless, they are intended to provoke thought about ways in which the C3D project members might influence the future.

Scenario 1: "Autonomous Success"

It is possible that all the centres are effectively sharing knowledge with each other, and with other developing countries. None has lost its independent perspective, but all have gained from a coordinated pooling of knowledge that has eliminated any remnants of intellectual dependence on developed countries, and maximised the negotiating power of the relevant policy-makers. A host of new centres are forming under the tutelage of the C3D centres, building on the intra-regional cooperation that the C3D project has fostered. The centres are buoyed by a steady income of revenue from courses and consultancies, and there are 10-20 trainers available in each centre.

Scenario 2: "Frustrated enthusiasm"

An alternative scenario is that while enthusiasm remains for the ideals of communities of practice, technological, administrative or logistical difficulties have prevented the centres from capitalising on their competitive advantages. Knowledge is not effectively pooled, except by word-of-mouth, and the negotiating power of policy-makers is hampered by continued reliance on developed countries for capacity development. There are one or two trainers available in each centre, drawing largely on printed text and lectures broadcast by satellite to ICT centres in major cities.

Scenario 3: "Competition overwhelms collaboration"

A third scenario is that while strong technological and administrative basics are in place, the demands of day-to-day working practices and scepticism about the value of sharing have led, again, to ineffective pooling of knowledge. In Africa and Asia, heap, lightweight, universal, high-speed video-enabled mobile technologies have rendered obsolete the need for the kind of landline-based telecommunications infrastructure that gave Europe and North America a head-start in the Information Age. However, the postmodern ethos of scepticism towards the value of knowledge and of cooperation has combined with an ever faster pace of life for diplomats. Experts in different countries compete rather than collaborate. As with the previous scenario, knowledge is not effectively pooled, and the centres have failed to capitalise on their competitive advantages. The negotiating power of policy-makers is hampered by continued reliance on developed countries for capacity development. There is one (extremely stressed!) trainer available in each centre.

Examples of Managing Knowledge
Knowledge is created, shared and applied in organisations even if there is no formal (or recognised method) of Knowledge Management. But certainly the active and explicit management of knowledge is seen as a fundamental source of success and survival for all kinds of organisations, regardless of size and industry, and whether they are profit-making or not.

Industry	Company	Processes/projects	Objectives
Consulting	Accenture	Best-practice sharing	Combined learning and knowledge sharing
	Celemi	Intangible assets monitor	Improved learning and strategic planning
	PricewaterhouseCoopers	Knowledge-sharing culture	Client service performance
Information technology	Hewlett-Packard	Laboratory core comptences	Expertise maps and networks
	Xerox	Communities of practice	Teamworking
	3M	Intelligence network	Innovation
Manufacturing	Hughes Aerospace	Lessons learned	Re-use of knowledge
	Unipart	Corporate university	Employee learning
Petrochemical	British Petroleum	Drilling lease negotiations	Virtual team co-ordination
Insurance and banking	NatWest	Expertise directory	Knowledge sharing
	Clarica	Intangible asset mapping	Strategic planning and value creation
	Thomas Miller	Groupware	Knowledge sharing
Utilities	Anglian Water	Competence and learning activities	Costumer focus
Government	Cabinet Office (UK)	Intranet	Better co-ordination
	DTI (UK)	Knowledge inventory	Systematic information
	Local governments	Learning processes	Skills and responsiveness
	National Security Agency (USA)	Practice centres	Winning proposals
	World Bank	Development Gateway	Best practice and skills exchange
	Various US, NZ, state and local level	Electronic town meetings	Broader involvement in decision making

Knowledge types

What sorts of knowledge are the C3D partners using and generating?

Blackler (1995) identifies five types of knowledge in the organisational learning literature, focusing on the ways in which knowledge is acquired, stored, represented or otherwise captured within individuals and organisations.

Each of which has implications for the way in which the organisation manages knowledge.

Embrained knowledge *(symbolic-analyst dependent)* links together the concepts of cognitive ability, abstract knowledge, knowing that or knowing about, and double-loop learning, all of which are focused on the individual, with shared visions and systems thinking, which have organisational scope. Here the individual has the power derived from internalised knowledge that cannot be easily captured.

Embodied knowledge (*expert dependent organisation*) links know-how and sensory or empirical knowledge derived from action and experience. It is therefore focused on the individual, within a context, and the individual derives power from this.

Encultured knowledge *(communication intensive organisation)* takes us to the group or community level and focuses on knowledge that is shared through socialisation and shared language. However, as the culture is not collected collectively then it is still hard for any agency (such as senior management) to control.

Embedded knowledge (*knowledge routinized organisation*) is knowledge that is captured in systems and routines. It is impersonal and embedded in technology and structures. It is therefore amenable to strong centralization of power and hierarchical control.

Encoded knowledge is knowledge that has been externalised and captured in code and is therefore available to anyone who can understand the code. It makes individual knowledge widely available, removing power derived from knowledge from the individual.

SUMMARY

- In order to strengthen the Community of Practice which consists of the C3D partners (ENDA, MIND, ERC, UNITAR, and OU), the project team might wish to consider the following questions:
    - What knowledge should the community be capturing?
    - How best can this knowledge be shared?
    - What are the financial, technological, administrative and logistical hurdles that each partner faces?
    - What can the community do to help?

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4. Review of training tools, activities, resources and courses relevant to C3D

SUMMARY

- There are large numbers of web sites providing various types of information relating to climate change.
- Surprisingly, there appear to be very few resources that purport to be "training" materials (online or CD-ROM-based).
- Many of the resources and the materials available could in principle be packaged together to create training courses.
- The "community" aspect seems to be missing.

4.1 Scope of this section

To complement the insights into the Open University's experience with ICTs contained in sections 2 and 3, the schedule of tasks for the project included a survey of relevant training materials and related resources available on the web. This section summarises the results of the survey.

4.2 Method

The team conducted a desk-based web search on the use of ICTs in training programmes and online distance learning in the field of climate change and sustainable development.

Key elements of the approach to the survey were as follows:

- The survey sought three main areas of ICTs: online courses, desktop software, and online applications.
- The survey covered the four main C3D topic areas.
- Data collection involved capturing short descriptions of ICTs using a standard template.

- Selected examples were scrutinised by the OU team.
- Over 1800 URLs were visited including those related to organisations in the list of participants from UNFCCC meetings, as well as many others.
- An external consultant with detailed background in the field of climate change and sustainable development was used to conduct the initial web search.

The criteria for success with the survey included the following components:

- The survey captures a good spread of current examples of ICTs on the web in the fields of climate change and sustainable development.
- There is a high degree of confidence that the survey is comprehensive.
- The survey captures a range of examples including the "good, bad and the ugly".

4.3 Results - overview

A great many online resources are available in the C3D topic areas - basic science, emissions, IPCC scenarios, mitigation, sustainable development linkages, tools, negotiating histories and guides. They include the following types of resources:

- web pages (not interactive)
- interactive web pages (e.g. a quiz providing feedback)
- e-books
- courses
- applets (e.g. the Java Climate Model)
- desktop software (e.g. the FAIR model)

In principle these resources could be packaged together into a structured, coherent training course, with modest effort.

However, our survey revealed the rather surprising result that while there are hundreds of organisations hosting sites with climate relevant information, very few have attempted or are attempting to pool and package materials into training of trainers courses, as the C3D project is doing. There had been the expectation that we could learn from other attempts to do similar things. To date we have found very little that is directly analogous to the context of the C3D project.

In fact, there are very few resources that purport to be online or CD-ROM-based "training" materials. Two dedicated online CC training courses were identified. One (IGES) is introductory and rudimentary. LearnSD/Earth Council could not be tested, but from its description has the potential to cover most topic areas of the C3D project, perhaps with some rigour.

Moreover, there are some examples of the speed at which the resource base on the web can change. For example, two highly regarded resources appear no longer to be available online – UNITAR's CC:TRAIN activity and VANDACLIM.

According to numerous sources, UNITAR provided the following online and CD-ROM-based training materials, with the primary purpose of capacity-building in LDCs:

- Workshop Package on Climate Change and the UNFCCC;
- Preparing a National Greenhouse Gas Inventory;
- Preparing a Climate Change Mitigation Analysis;
- Preparing a Climate Change Vulnerability and Adaptation Assessment;
- Preparing a National Implementation Strategy;
- Workshop Package on the Preparation of Initial National Communications by Non-Annex I Parties.

This material is no longer available online, nor are there any links to the CD-ROM version that was once available.

Meanwhile, VANDACLIM is an integrated assessment model that has been adapted for use as a training tool for vulnerability and adaptation assessments. VANDACLIM was developed by the International Global Change Institute at the University of Waikato, New Zealand, with the support of UNITAR's CC:TRAIN activity (see above). VANDACLIM is no longer available from the IGCI. It has also been removed from the UN University-backed Global Environment Information Centre website. A similar training model, TrainCLIM, is due to be commercially available from the IGCI's commercial spin-off "Climsystems Ltd", from December, 2004 (http://www.climsystems.com/site/downloads/).

In relation to basic climate science, emissions scenarios and mitigation analysis, many there are many online resources, almost exclusively drawing on IPCC data. The Global Commons Institute's visualization tools, for example, although dedicated to "contraction and convergence", offer a particularly powerful and immediate means of grasping the challenge reducing global emissions over the next century.

In the areas of vulnerability and impact assessment and adaptation tools, typical tools include: regional climate models, crop yield models, soil carbon models, coastal erosion models, etc. These models require extensive datasets for input, user training, and frequently professional expertise in the relevant science. It was not possible to review any of these models within the scope of this exercise.

The UNFCCC compendium of such models is largely out of date. AIACC maintains a more current list of simple climate models, crop models, water resource models and ecosystem models at: http://sedac.ciesin.columbia.edu/aiacc/toolkit.html. This is not a comprehensive list, however. For example, under climate models it mentions MAGICC/SCENGEN, but not SDMS or PRECIS.

There are also a number of tools to help understand and select individual impact assessment/adaptation tools. The National Communications Support Programme has produced a publication which intends to help developing countries develop a strategic approach to Vulnerability Assessment and adaptation policy choices: http://www.undp.org/cc/apf.htm (see the "Adaptation policy framework" case example).

There is also a comprehensive UNEP/IVM guide: IVM/UNEP Handbook on methods for climate change impact assessment and adaptation strategies. These publications guide the reader through the strategic and technical issues surrounding vulnerability assessment and adaptation, including stakeholder participation, choice of analytical tools, and integration with other policy areas.

There are one or two key UN-funded reports/guidebooks online that seek to convey the complex areas of vulnerability assessment and adaptation. Online UNITAR material that may have been more interactive has disappeared. Packaging of the existing material would require major effort.

For training in the use of local climate and ecosystem models, the existing models would likely need to be simplified and made more accessible to users. The initial choice of tools is critical and would require a major evaluation effort.

Very little (of use) appears to exist on the topic of negotiating issues. The e-book "On behalf of my delegation" stands out all the more so as a result, even though it contains only a short discussion of policy stances, the rest being a "how-to" guide for new UNFCCC developing country delegates. This topic material must be very current and even government funded websites performed badly in this regard. The only reliable resource coming close to the requirements of training material was the online archive of the Earth News Bulletin, from IISD.

4.4 The range of resources available

The review led us to a finer structure for a typology of resources as follows:

- Non-interactive web pages
    - Topic or issues-based web pages (e.g. IETA's pages)
    - Q&A/FAQ formats (e.g. the UK Science Museum)
    - Q&A misconceptions (e.g. Woods Hole Institute)
    - Glossaries (e.g. IPCC hosted at GRID Arendal)
    - Online presentations (e.g. IPCC hosted at Grid Arendal)
    - E-Books
        - Guidebooks (what's it all about books, e.g. UNFCCC)
        - Handbooks (how to books, e.g. RIVM Adaptation Handbook)
    - Workshop materials online (collated resource packs and other information) (e.g. GEF's country dialogue workshops programme)
    - Clearing Houses (e.g. UNFCC's TT: Clear, Greentie)
    - Knowledge Networks (e.g. CCKN)
    - Blogs
- Interactive web pages

    - Databases (including advanced clearinghouses) (e.g. TT: CLEAR)
    - Quizzes
    - Interactive online applets, usually involving models or maps (e.g. Java Climate Model)
    - Courses (e.g. Learn SD)
    - Online discussion forums
    - Games
- Interactive Desktop Software
    - Stand alone (e.g. the FAIR model).
    - Web/Community connected

There seemed to be very little active “community” models for online learning. This is perhaps a gap that C3D could exploit.

4.5 Illustrative examples

The following examples illustrate the range of resources we have found to date using the database of cases in the survey. It is provided as a way of illustrating what is available, and is not intended to be comprehensive. It is supposed to reflect the breadth of different types and qualities of resource out there.

Climate Change & Market Mechanisms

http://www.ieta.org/ieta/www/pages/index.php?IdSiteTree=3

Publisher: IETA

Resource Type: non interactive web pages - topic or issue based

C3D Topics: Tools

Target Audiences: Policymakers, Public

Link to C3D Objectives: Improved understanding of Kyoto flexibility mechanisms and knowledge of real-world emissions trading

Provenance: MEDIUM - not for profit industry association

Relevance: GOOD

Factual Accuracy: Good - references and links to UNFCCC, IPCC

Appeal: Medium - clearly set out but bland text predominates

Usability: Good

Earth Negotiations Bulletin

http://www.iisd.ca/voltoc.html

Publisher: IISD

Resource Type: non interactive web pages - topic or issue based

C3D Topics: Negotiation

Target Audiences: Policymakers

Link to C3D Objectives: Improved understanding of policy stances of Parties

Provenance: GOOD – IISD widely regarded as a neutral view of UNFCCC negotiations

Relevance: GOOD

Factual Accuracy: unknown

Appeal: LOW – web version of daily bulletins during UNFCCC meetings; dense text

Usability: GOOD - straightforward

Climate, Forests and People Information Desk

http://www.iucn.org/themes/carbon/

Publisher: IUCN

Resource Type: non interactive web pages - topic or issue based (Q&A format)

C3D Topics: GHG, VIA, Tools, Negotiation

Target Audiences: Policymakers, CDM Project managers and investors

Link to C3D Objectives: Improve understanding of CDM forestry project negotiations, areas of uncertainty, project cycle

Provenance: GOOD

Relevance: GOOD

Factual Accuracy: GOOD

Appeal: GOOD

Usability: GOOD Simple Q&A design

Climate Change: The Burning Issue

http://www.sciencemuseum.org.uk/antenna/climatechange/index.asp

Publisher: UK Science Museum

Resource Type: non interactive web pages - topic or issue based (Q&A format)

C3D Topics: VIA, Tools

Target Audiences: Students and policymakers

Link to C3D Objectives: Improved basic understanding of CC science and mitigation and adaptation options

Provenance: MEDIUM – national educational institution, but few references provided

Relevance: MEDIUM – coverage of basic science, mitigation, adaptation, but at introductory level; some elements not up to date

Factual Accuracy: GOOD

Appeal: GOOD – well-judged nesting of information; visually appealing

Usability: GOOD - straightforward navigation, Q&A-style

Scientific Facts on Climate Change and Global Warming

http://www.greenfacts.org/studies/climate_change/level_1.htm#1

Publisher: GreenFacts

Resource Type: non interactive web pages - topic or issue based (Q&A format)

C3D Topics: VIA, Tools

Target Audiences: All

Link to C3D Objectives: Foster understanding of CC science, impacts and mitigation options

Provenance: GOOD

Relevance: GOOD

Factual Accuracy: GOOD – structured around IPCC Third Assessment Report

Appeal: GOOD – simple 12 step Q&A leads user to summary of key points of IPCC TAR, then to details and supporting TAR documents.

Usability: MEDIUM - nested structure could be disorienting

Abrupt Climate Change

http://www.whoi.edu/institutes/occi/currenttopics/abruptclimate_15misconceptions.html

Publisher: Woods Hole Oceanographic Institute

Resource Type: non interactive web pages, Q&A (misconceptions)

C3D Topics: VIA, Tools

Target Audiences: All

Link to C3D Objectives: Improved understanding of CC impacts

Provenance: GOOD

Relevance: GOOD (addresses topic - Sudden Climate Change – not well covered elsewhere)

Factual Accuracy: GOOD

Appeal: GOOD

Usability: GOOD – simple Q&A format

Background Publications

http://unfccc.int/essential_background/background_publications_htmlpdf/items/2625.php

Publisher: UNFCCC

Resource Type: non interactive web pages -eguidebook

C3D Topics: GHG, VIA, Tools

Target Audiences: all

Link to C3D Objectives: Improved understanding of climate science, mitigation & adaptation options, UNFCCC process

Provenance: GOOD

Relevance: GOOD

Factual Accuracy: GOOD

Appeal: POOR – dense, text-based guides; pdfs not adapted for web

Usability: MEDIUM – straightforward, but could have better guidance on contents of documents

Implementation of the Kyoto Protocol: Opportunities and Pitfalls for Developing Countries

http://www.adb.org/documents/books/Kyoto_Protocol/default.asp

Publisher: Asian Development Bank

Resource Type: ebook - "how to", in sections

C3D Topics: GHG, Tools

Target Audiences: Researchers and Policymakers

Link to C3D Objectives: Training of policy-makers, esp. on CDM application in specific developing countries

Provenance: GOOD

Relevance: GOOD (addresses topic - Sudden Climate Change – not well covered elsewhere)

Factual Accuracy: GOOD

Appeal: LOW – dense text, not re-formatted for web

Usability: MEDIUM – online book, simple navigation

Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies

http://www.falw.vu.nl/images_upload/151E6515-C473-459C-85C59441A0F3FB49.pdf

Publisher: UNEP

Resource Type: ebook, (handbook)

C3D Topics: VIA, Tools

Target Audiences: Researchers, Policymakers

Link to C3D Objectives: Improved capacity to identify and apply tools for impact assessment and adaptation analysis, in general and for specific sectors

Provenance: GOOD – UNEP-funded, authored by large number of leading practitioners

Relevance: GOOD

Factual Accuracy: Not Known

Appeal: LOW – pdf version of large, dense report

Usability: MEDIUM – straightforward, but many referenced resources are offline

On Behalf of My Delegation

http://cckn.net/delegation.htm

Publisher: Climate Change Knowledge Network

Resource Type: ebook - (handbook) in sections

C3D Topics: Tools, Negotiation

Target Audiences: Policymakers

Link to C3D Objectives: Improved capacity to negotiate in UNFCCC process

Provenance: GOOD – Guide by UNFCCC delegate

Relevance: GOOD

Factual Accuracy: GOOD – with good, sensible references

Appeal: MEDIUM – straightforward, but a bit bland

Usability: GOOD – simple, well-implemented e-book

Adaptation Policy Framework

http://www.undp.org/cc/apf.htm

Publisher: UNDP

Resource Type: ebook - in sections

C3D Topics: VIA, Tools

Target Audiences: Researchers and Policymakers

Link to C3D Objectives: Guide to identifying CC adaptation policies and mainstreaming them into sustainable development plans

Provenance: GOOD – UNDP/GEF project

Relevance: GOOD – addresses vulnerability assessments/adaptation options within context of National Communications

Factual Accuracy: Not known

Appeal: LOW – Technical articles in pdf form

Usability: MEDIUM – simple structure, but frequent references to expert techniques that are not explained on-site. Material is dense and requires a separate guide to using the primary publication, which is itself a guide.

Global Environment Facility: Country Dialogue Workshops Programme

http://www.undp.org/gef/workshop/facilitation/english.htm

Publisher: UNDP

Resource Type: non interactive web pages - workshop resources

C3D Topics: GHG

Target Audiences: Policymakers

Link to C3D Objectives: Improved capacity to develop mitigation projects

Provenance: GOOD

Relevance: GOOD – increases knowledge of Global Environment Facility project cycle

Factual Accuracy: GOOD

Appeal: POOR – material designed to be presented "live"; lacks context and supporting material

Usability: Good

Climate Compendium

http://www.cckn.net/compendium/

Publisher: Climate Change Knowledge Network

Resource Type: non interactive web pages - knowledge network

C3D Topics: Negotiation

Target Audiences: Policymakers

Link to C3D Objectives: Improved knowledge of negotiating stances of UNFCCC Parties

Provenance: GOOD – funding from US and Canada government agencies, hosted IISD

Relevance: MEDIUM – compiles a range of discussion papers relating to UNFCCC negotiations, but not up to date

Factual Accuracy: LOW – trustworthy resources, but discussion of state of negotiations stops in mid-2001

Appeal: MEDIUM – good visual appeal, but underlying resources are mainly plain text documents

Usability: GOOD – straightforward navigation and clear organisational headings

EarthTrends

http://earthtrends.wri.org/

Publisher: World Resources Institute

Resource Type: interactive database (plus data visualisation)

C3D Topics: VIA

Target Audiences: Students and policymakers

Link to C3D Objectives: Improved understanding of climate impacts, and some policy issues

Provenance: GOOD – leading, independent analytic organisation

Relevance: MEDIUM - narrow, non-comprehensive coverage; scattergun approach

Factual Accuracy: GOOD, with good references

Appeal: MEDIUM - core of resource is maps of global temp., carbon storage in forest etc., but maps too small to convey much meaningful information

Usability: GOOD - simple navigation

IDB E-COURSES

http://www.iadb.org/int/rtc/ecourses/index.htm

Publisher: Inter-American Development Bank

Resource Type: Online Course

C3D Topics: GHG

Target Audiences: Researchers

Link to C3D Objectives: Training in project monitoring, evaluation and (forthcoming) environmental impact assessment. N.B. not climate change-specific

Provenance: GOOD

Relevance: MEDIUM

Factual Accuracy: not applicable

Appeal: not applicable

Usability: not applicable

The Greenhouse Effect and Climate Change

http://www.earthcouncil.com/angel/courses_overview.asp?section_id=01-ardl-gvu-ghecc-a

Publisher: Earth Council Learning Center

Resource Type: Online Course

C3D Topics: GHG

Target Audiences: All

Link to C3D Objectives: Various

Provenance: Not known

Relevance: Not known

Factual Accuracy: Not known

Appeal: Not known

Usability: Not known

DDC Visualisation Pages

http://ipcc-ddc.cru.uea.ac.uk/asres/sres_visualisation.html

Publisher: IPCC

Resource Type: applet, interactive data visualisaton

C3D Topics: VIA

Target Audiences: Researchers, Policymakers

Link to C3D Objectives: Enhanced understanding of impacts of climate change

Provenance: GOOD - IPCC website

Relevance: GOOD

Factual Accuracy: GOOD

Appeal: GOOD – clear maps of global climate impacts for all standard emissions scenarios

Usability: MEDIUM – simple to use but definitions and explanations not immediately available

Java Climate Model

http://climatechange.unep.net/jcm/

Publisher: UNEP

Resource Type: applet, interactive data visualisaton, modelling

C3D Topics: VIA, Tools

Target Audiences: Students, Researchers, policymakers

Link to C3D Objectives: Better understanding of climate science, impacts and mitigation options

Provenance: GOOD – Model implementing science underpinning latest IPCC report; UNEP-sponsored

Relevance: GOOD

Factual Accuracy: UNKNOWN – quality of implementation of IPCC material not tested, not reviewed

Appeal: POOR – dense, complicated; first impression is of a model for experts only

Usability: MEDIUM – very complex, linked models can be controlled in reasonably straightforward manner; comprehensive HELP feature

Statistical Downscaling Model

http://www-staff.lboro.ac.uk/~cocwd/SDSM/index.html

Publisher: UK Environment Agency

Resource Type: desktop software - interactive, modelling

C3D Topics: VIA

Target Audiences: Researchers

Link to C3D Objectives: Increased knowledge of local climate, using global GCM climate data as input

Provenance: GOOD – developed by UK Environment Agency for UK climate impact studies

Relevance: GOOD – produces local fine-detail climate scenarios

Factual Accuracy: Not known – not run/tested

Appeal: Not known – not run/tested

Usability: Not known – not run/tested

FAIR

http://www.rivm.nl/fair/introduction/

Publisher: RIVM

Resource Type: desktop software - interactive, modelling

C3D Topics: VIA, Tools

Target Audiences: Policymakers

Link to C3D Objectives: Improved understanding of the effects of various GHG abatement regimes on future climate impacts, abatement costs and emissions trading

Provenance: GOOD – model is based on IPCC scenarios and benchmark abatement-cost models

Relevance: GOOD – explores implications of possible future treaty obligations

Factual Accuracy: UNKNOWN – accuracy of implementation of underlying data and models not tested

Appeal: MEDIUM – clunky appearance; some legibility problems

Usability: MEDIUM – easy to modify parameters and observe results, however limited explanation of concepts within actual model

http://grads.iges.org/home.html

Publisher:

Resource Type: desktop software - interactive, data visualisation

C3D Topics: GHG, VIA, Tools

Target Audiences: Students and policymakers

Link to C3D Objectives: Foster basic understanding of climate change science, impacts, mitigation options

Provenance: UNKNOWN – governance/ownership not indicated on website

Relevance: GOOD

Factual Accuracy: Generally good. Based largely on IPCC/UNITAR sources. Some errors due to over-simplification

Appeal: POOR. Many essential graphics unreadable.

Usability: Good

Climate Analysis Indicators Tool

http://cait.wri.org/login-main.php

Publisher: World Resources Institute

Resource Type: desktop software - excel workbook, data manipulation and visualisation

C3D Topics: VIA

Target Audiences: Students, Researchers, policymakers

Link to C3D Objectives: Improved understanding of sources of GHG emissions

Provenance: GOOD – Leading independent analytic institute

Relevance: GOOD – comprehensive dataset of emissions, by country

Factual Accuracy: Not known – good data sources cited (non-UNFCCC) but accuracy of implementation not known

Appeal: MEDIUM – basic spreadsheet format straightforward layout

Usability: MEDIUM – Huge amount of information presented reasonably well; user faces significant learning curve to reach point of making full use of the program

Contraction and Convergence Options Model

http://www.gci.org.uk/model/dl.html

Publisher: Global Commons Institute

Resource Type: desktop software, interactive model

C3D Topics: Tools, Negotiation

Target Audiences: Researchers and Policymakers

Link to C3D Objectives: Improved understanding of GHG abatement regimes, especially contraction and convergence, and treatment of related issues (e.g. equity, cost-benefit analysis) in UNFCCC process

Provenance: GOOD – rare insight into how North-South equity issues have been treated in convention

Relevance: GOOD

Factual Accuracy: GOOD - C&C model based on IPCC sources; accuracy of implementation not tested

Appeal: GOOD – graphics and model quickly show links between abatement policy choices and national emissions allocations

Usability: MEDIUM – straightforward, but text/data too crowded in some cases

Environmental Biophysics and Modeling

http://environment.eas.cornell.edu/software.htm

Publisher: Cornell environmental science dept.

Resource Type: desktop software, interactive model

C3D Topics: VIA

Target Audiences: Researchers

Link to C3D Objectives: Analysis of impacts of CC on agriculture

Provenance: GOOD – Cornell environmental science dept.

Relevance: GOOD – model shows how crop yields vary with varying climate

Factual Accuracy: UNKNOWN – model requires input climate, soil and crop data

Appeal: Not tested

Usability: Not tested

4.6 Example Programme: the OU's Global Development Management courses

Development Management Online enables students to do a certain amount of their studies online. In the Development Management core courses (TU870, 871, 872 and 874) the online component comprises:

- course materials made available on the web
- electronic assignments (eTMAs): this is an OU system for submitting marking and returning assignments electronically
- online tutorials with a tutor and others in a tutor group, through a conferencing system called FirstClass.

The following awards are possible through Development Management Online:

- Postgraduate Certificate in Development Management (60 points)
- Postgraduate Diploma in Development Management (120 points)
- MSc in Development Management (180 points)

The following courses are available in Development Management Online (with their summaries for prospective students):

TUZX871 Development: Context and Practice

This foundation course for our MSc in Development Management gives a grounding in development studies for those entering the postgraduate programme without an academic background in the subject, or those that want to bring their knowledge up to date. Through a multi-disciplinary approach, it introduces concepts that help understanding and analysis of development processes and practices, and explores the meaning and challenge of today's international development from local to global levels. The course is not restricted to particular geographical areas, recognising that development is a global concern.

TUZX870 Capacities for Managing Development

This course defines the agencies and people involved, and provides a conceptual framework and develops appropriate skills. It has been specially prepared for development practitioners in governments, non-governmental organisations, intergovernmental agencies, and public and private enterprises, and is suitable for those who want to work in this field, either in developing countries or in Europe. Development policy is considered as process, covering the planning of intervention, with tools for the design and management of development projects; monitoring and evaluation, and sustainability and learning. The course also develops sound investigative and strategic skills.

TUZX872 Institutional Development: Conflicts, Values and Meanings

Institutional development (ID) is a key area for those working in development management. It concerns the promotion of change in institutions, in the dual sense of changing organisational structures, and adopting new norms and values. The first part of this course looks at political and ethical issues, considering different approaches to ID in the contexts of aid policy, governance, economic growth, and humanitarian interventions. Managing inter-organisational relationships is the next topic, developing conceptual skills and practical tools that can be applied in multi-organisational situations. Part three continues with development of mapping and modelling as well as developing negotiation and brokering skills.

TUZX874 The Development Management Project

This is the final, compulsory element in our MSc in Development Management. It involves an independent piece of work that integrates knowledge gained from the programme with an example of current practice in development management. The course builds skills in research project management and develops ability to plan, organise and carry out an independent project at postgraduate level. It also allows students to bring their own concerns and experience to the analysis and application of a practical situation in development management.

Further details

There is a preferred (but not compulsory) study route in the order listed above. In this scheme, the four Development Management courses are available twice a year in November and May. Course materials are sent to addresses in the UK or elsewhere in the European Union. In addition, each TU course will have most of its key initial materials available for downloading off the internet. Those that will not be available electronically include textbooks, videos and audio cassettes. The electronic availability of course materials is only a backstop to the normal 'paper' mailings to enable students to get going if the mailing is late for some reason.

Electronic support for the TU courses takes place in the following way:

- e-mail for everyday direct communication with tutors
- use of eTMAs (electronic assignments)
- electronic tutorials using FirstClass conferencing (computer specification requirements).

The tutors will be Associate Lecturers based in the UK or elsewhere in the European Union. Each student is allocated to a tutor group that is taught electronically. Students also join other tutor groups for online activities and discussion. Some courses (for example TUZX872) have compulsory residential schools held in the UK. Students therefore have to be prepared to travel to compulsory residential schools as there are very limited grounds for excusal.

5. Opportunities/barriers for the C3D centres

5.1 Scope of this section

UNITAR's document *Synthesis of Needs Assessments Conducted by Partner Institutes* identified the following pressing needs:

- Assistance in revising existing pedagogical materials to promote a more interactive and stimulating methodology.
- Assistance in designing appropriate adult training materials.
- Assistance/training in pedagogical design for distance learning.
- Training of trainers for distance learning.

This section of the report identifies specific opportunities and barriers in each of the three C3D centres in relation to the use of ICTs in pursuit of C3D's overall objectives.

Specifically this section:

- Synthesises general lessons on current status and future prospects regarding use of ICTs to address specific training needs in the three regions
- Identifies options for the further integration of ICTs into the overall project
- Makes concrete proposals for distance learning on climate change for the project partners

5.2 Identifying needs, opportunities and barriers: methods

While the OU's input to C3D is restricted to the literature and reviews provided, a number of techniques have been employed to try to stimulate a conversation among C3D partners about needs, opportunities and barriers. These include:

- The use of a Knowledge Network workspace to store materials that might stimulate discussion and debate.
- A detailed 24 point questionnaire incorporated into the November 29th 2004 circulated draft.
- One-to-one interviews with project partners conducted during COP10.
- Various levels of email correspondence between the OU and centres.

We outline the results of these methods below.

Description of OU C3D Knowledge Network space and materials

The members of the Open University C3D team have been using a Knowledge Network space as a place in to make their contributions to the project available to the C3D partners.

This workspace allowed us to make available papers, links and other materials that were relevant to the centres' needs, without their having to wait for the draft report. It also enabled those centres dependent on slow or expensive dial-up connections to the internet to choose when or if to download lengthy reports, rather than clogging up email inboxes. The fact that the workspace is strictly access-controlled meant that we were able to share restricted OU reports and copyrighted papers that are not for public distribution. This workspace was created before the CERN platform became available, but many of these materials have also now been published on the CERN platform.

All members of the project are able to comment on resources posted here, and post their own resources. Although we hoped for some dialogue to result from these resources, we recognise the severe time-pressures under which the centres are operating.

In section 3 of this report, the OU's Knowledge Network was used as a case study to illustrate the exploitation of ICTs for knowledge management. We hope that the C3D participants have found it valuable to be able to experiment, first-hand, with this technology. Recently, the Knowledge Network won the Open University the 2004 International Information Industry Award for innovation in knowledge management. The application behind it was a finalist in the 2002 European Academic Software Awards, and the team who developed and run the service has been recognised by an OU Teaching Award in 2003 for its contribution to enhancing the student experience at the Open University.

Inside the OU, KN technology powers the websites of many University groups and projects focused on improving teaching and learning. The team seeks out relevant content, inside and outside the OU, and fosters a culture of sharing across the university, to support communities of educational practitioners and researchers.

Outside the OU, KN technology powers RESL, the national library to support good practice in the re-use of educational software; HAN, the humanities higher education network, with members in over 170 institutions from over 20 countries; the forthcoming Knowledge Resource Network, in collaboration with Cambridge University and MIT; and the UK government's current e-learning research consultation.

The link to get to the workspace is http://kn.open.ac.uk/workspace.cfm?wpid=3796

Usernames and passwords for the service have been previously distributed. Please contact James Aczel (j.c.aczel@open.ac.uk) if you would like to be reminded of your login details, or if you have any difficulties with the service.

Materials posted in the workspace include:

- Chapter 5 of Martin Weller's popular book *Learning on the net* (Weller, 2002)
- Critique of learner-centred pedagogy (Tabulawa, 2003)
- Is online learning educational? (Dreyfus, 2001)
- The pedagogic strategy of D833 *Environmental Practice: Negotiating Policy in a Global Society* (Humphreys, 2002; Thorpe, K. , 2002)
- Comments on a draft ERC module
- Introduction to pedagogy (Conole et al, 2004)
- Study Guide for Block 4 of the OU course H802 (Applications of Information Technology in Open and Distance Education)
- How to build interactive questions into your course
- 10 Damaging E-learning Myths
- Jakob Nielsen on usability and e-learning

5.3 Discussion: needs, opportunities and barriers

A short questionnaire was used as one way to elicit the specific opportunities and constraints that C3D centres face in relation to the identified needs. Verbatim written responses from the centres are included in an Annex. The questionnaire was designed to extract conversation around some of the concepts introduced in sections 2, 3 and 4 of this report and in particular:

- Pedagogical approaches and making online courses

- Becoming a community of practice
- Knowledge Management / Learning Organisations
- Exploiting Competitive Advantage

The questionnaire included a combination of closed and open questions on various topics. The ideal way to tease out the answers to such questions would be to supplement the questionnaire with a workshop/brainstorm or a telephone conference. Neither of these options was possible in the scope of this desk study project. The Annex also contains a summary of the key points emerging from face to face interviews with the centres carried out at COP10.

Prospective students and educational aims

The responses to these questions show some differences in emphasis between the centres, but more detailed analysis of learner needs in relation to particular learning outcomes might highlight opportunities for the centres to exploit ICT to suit distinct purposes.

So, ENDA is clear that it is training trainers to build their own tools, but the range of needs of these trainers is not yet clear. The construction of generic resources must therefore have adaptability and reusability as paramount considerations.

Meanwhile, MIND and ERC both emphasise government officials, NGOs and the private sector (see Figure 15). ERC has the slightly broader target population, and mentions university analysts, utilities and members of the NCCC. This suggests that thought needs to be given as to whether it is better to tailor teaching to these groups separately, or to build on the diversity of perspectives and prior knowledge that a mixed cohort of learners would have.

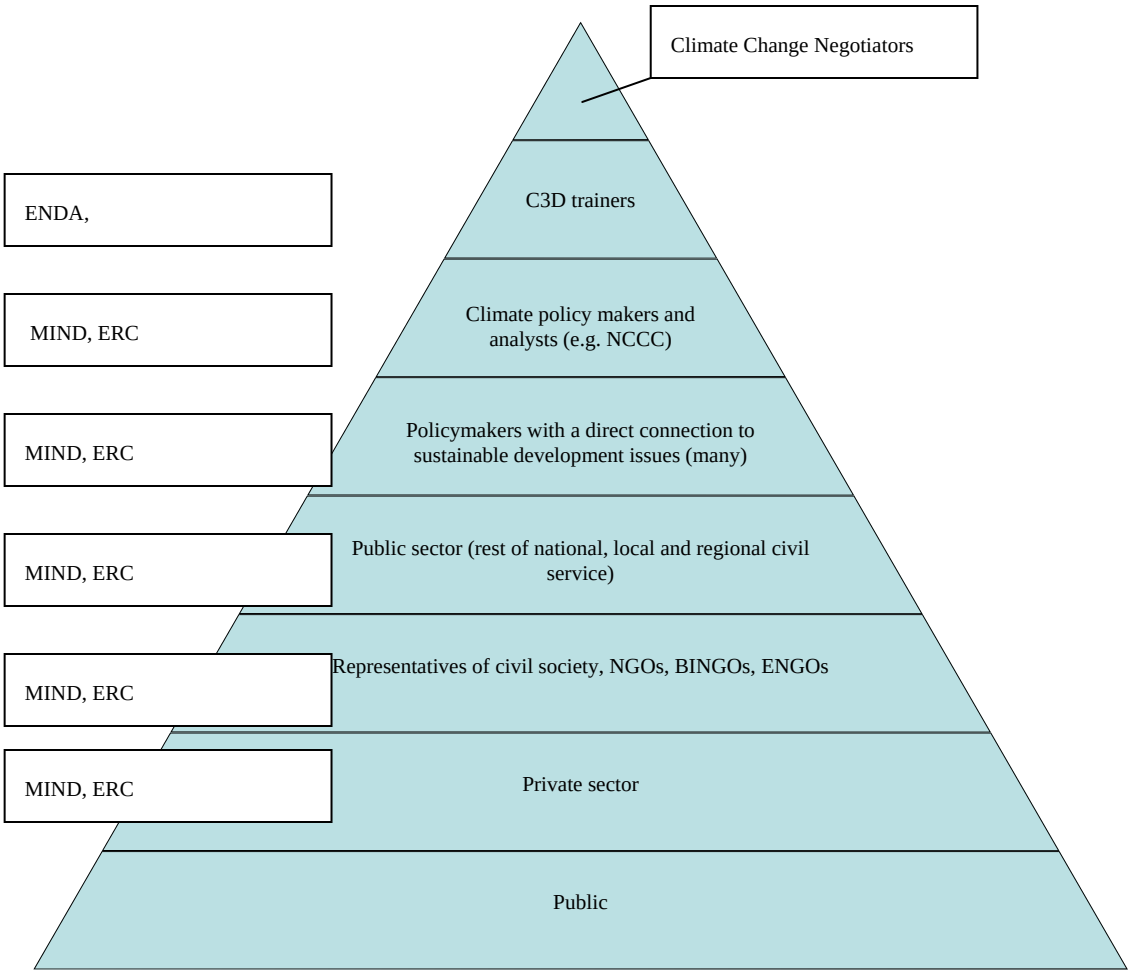

Figure 15: The C3D training pyramid

Implications for teaching strategies

When the centres are ready to specify more detailed learning objectives and more detailed profiles of their target learners, different teaching strategies might be appropriate for different target outcomes. Crudely, one could consider **scientific**, **social**, **rhetorical** and **technical** sets of learning outcomes (although we do not wish to imply that this distinction is authoritative).

So, for example, an understanding of the **scientific** issues associated with climate change by learners with diversity in their prior scientific knowledge might be considered, arguably, to be best engendered by a *problem-based approach* in which a group of learners identifies for itself the gaps in its collective scientific knowledge, and divides into smaller groups that each explores the resources provided by the C3D centres with respective to a different topic; and then prepares seminars to teach their peers. The role of

the tutor is then to help the group of learners as a whole to identify these gaps; to seek out resources that the sub-groups may find valuable (e.g. research materials on sea level changes, textbooks in handling advanced statistics, guest lectures by emissions specialists); and then to correct any theoretical misunderstandings that arise. The emphasis is constructivist or social constructivist.

Alternatively, a stepped approach to building scientific understanding would involve several levels, starting from one where little prior scientific knowledge is assumed. Teaching materials would be carefully constructed, rather than (as in the problem-based learning approach above) mixing introductory materials with research papers. Significant investment of resource in developing or buying interactive multimedia software and formative assessment technologies would be required. These would be carefully tested and honed, and integrated to provide a coherent *narrative*. The emphasis is behaviouristic, and on presentation and feedback software rather than on discussion or practical work. The cost of the computers required to run this software would be high, perhaps prohibitively so in some developing countries. At higher levels, successively more scientific knowledge would be assumed; but successively less honing of materials would take place. At the highest levels, the teaching technologies used would be indistinguishable from the technologies used by scientists themselves; the materials would be indistinguishable from research papers; and the assessment would not be on the basis of "right or wrong" answers, but on the basis of the depth and breadth of understanding achieved.

However, this account of the development of scientific understanding has limitations. The C3D "curriculum" mirrors the scope of the IPCC's work and is therefore as broad and complex. The three worlds of adaptation, mitigation and sustainable development conceal within them further worlds within worlds of academic understanding and methodological skill. At one level there are potentially complex interdisciplinary understandings necessary to complete for example, the tables in the AIM tool that MIND has developed. An appreciation for example of the connections between various factors and sustainable development requires roaming knowledge across a variety of areas such as water, health, agriculture etc (each with their own models related to adaptation). This contrasts with the training required to complete a national emissions inventory using such tools as the IPCC's emissions factor database. A further example is the non-trivial skill set necessary to construct non-standardised baselines for CDM projects.

An understanding of the **social** issues associated with the C3D project refers to the requisite aspects of economics, sociology, geography, social psychology, and social policy. It is not clear whether a stepped approach would be harder to achieve here, although the text-focused nature of asynchronous online discussion forums naturally seems to lend itself to collaborative approaches to these subject areas that build on diverse learner backgrounds. Nevertheless, access to such technologies depends on reliable telecommunication infrastructures (fixed line or mobile); and this is not currently always the case in developing countries. There would need to be a balance of opportunities for private learning and for group communication and collaboration; a mix of narrative, discussion and reflection; opportunities to explore simplified models; and a mix of assessment modes, centred on written documents such as essays, policy statements, briefings and legal instruments. ERC also gives the example of mitigation

costing exercises, which naturally lend themselves both to problem-based learning and to interactive software.

By a set of "**rhetorical**" learning outcomes, we mean skills of persuasion, negotiation, influence, compromise, and so on. Building capacity in learning outcomes related to these skills might require rather more practical teaching strategies than identified above. For example, in the early stages of learning, human simulations of international negotiations (e.g. through video or audio conferencing, or face-to-face, as suggested by ERC) could be followed by debriefing sessions, in which learners are given evaluations of their performance by tutors. This would then motivate the study of rhetorical strategies, briefings by diplomats on political sensibilities, "fast facts" drawn from popular economics and scientific accounts to enable rapid rebuttal, and the like. The emphasis, though, is more on experience and reflection than on information and automated feedback. A subsequent simulation and debriefing session would allow learners to test out these techniques in practice.

In the next stage of building rhetorical skills, the idea of a community of practice becomes central: opportunities for apprenticeship and mentoring in authentic settings are sought. Here, the materials are not designed by an educator, but are the real artefacts of climate change negotiation. The communication technologies are those of the negotiators. The feedback is provided by success or failure in helping your country achieve its goals.

Technical skills are different again. For popular technologies, there are likely to be very many similar training models and materials available worldwide. For specialist technologies (such as the most advanced climate models), the challenges are likely to be as much scientific as technical. In either case, it is known that some learners prefer solo, hands-on, problem-based experimentation, with occasional access to an expert. Others prefer the more structured presentational approach described above (in relation to the stepped approach to scientific knowledge). Others will gain all they need to know from reading the manual.

In relation to all four of these sets of learning outcomes (scientific, social, rhetorical and technical), we offer these suggestions not as definitive answers, but as examples of how one might analyse learning outcomes and learner profiles to produce concrete proposals.

Developing a community of practice of climate change policy negotiators

The questions about a "C3D community of practice" – on the nature of the C3D community, the external groups with which it communicates, the knowledge it needs to capture and share, and so on – serve three purposes:

The Project – Most obviously these questions focus attention on ideas for improving project processes. However, this was a minor consideration, because of the short-term nature of the project.

Cognitive apprenticeship – Our second aim in including these questions, along with the "How did you learn what you know?" question, was to focus attention on how more citizens of developing countries might become apprentices in a wider community of practice of climate change policy negotiators. This relates to our main distinction in this

report between ICT used to support formal methods of learning (e.g. online courses) and ICT used to support informal methods of learning (e.g. communication tools, needs elicitation software, virtual participation in conferences). It is our view that effective training of prospective negotiators should ideally combine formal aspects with the more informal kinds of cognitive apprenticeship model described in 2.15 above. The opportunities afforded by the latter approach are closely related to the ICT-enhanced knowledge management strategies discussed in section 3.

Broadening pedagogical horizons – Our third aim, (again, along with the "How did you learn what you know?" question), was to attempt to broaden partners' perspectives about the range of teaching strategies they should consider in designing training and in designing training for trainers. It is our view that designing interactive and stimulating training that takes advantage of ICT opportunities could involve not just high quality online materials and software tools (presentation and feedback components, respectively), but also communication components. We now elaborate this view.

Tutorial activity

With respect to broadening pedagogical horizons, the practical carriers of cost and access to technologies (particularly pertinent in developing countries) cannot be ignored. It is interesting that the question of the mix of technologies elicited very different responses from the three centres; and perhaps these differences reflect facets of each centre's knowledge of the local and regional constraints under which it operates that are implicit in the range of choices being considered.

The responses to the questionnaire and interviews seem to suggest that the centres are primarily interested in the ideas of building high quality interactive tools (particularly MIND and ENDA) and of tailoring conventional presentational texts to the affordances of the web; and more tentative about the nature of any tutorial activity. Nevertheless, MIND also mentions two-way communication; and ENDA adds "internet", which could indicate presentation (e.g. webpages and databases) or two-way communication (e.g. email and web–based conferences) or both.

Nevertheless, the responses to the question about course tutoring suggest a little uncertainty about who would take on this role.

The pedagogical value of such activity in the context of OU courses is long accepted: see, for example, section 2.4 above on communication components; the points made by Blake (2000) in section 2.12 about the benefits of text-focused conferencing; the links made by Conole et al (2004) between socially-situated learning and online communication in section 2.14; Weller's (2002) account of collaborative learning and problem-based learning in section 2.15); the example of D833 *Environmental Practice: Negotiating Policy in a Global Society*, provided in section 2.18; and the example of the Global Development Management programme in section 4.6.

However, the situations of the C3D centres may constitute a very different context. Face-to-face tutorials may be preferred for a variety of valid reasons. Or standalone materials, without tutorials, may be preferred for similarly sound reasons. As is well, known, geographical, financial, technical, and other practical considerations can be problematic in relation to telecommunications and computer hardware in some developing countries.

(Human Development Report, 2001; bridges.org, 2003). Internet access in wealthier countries can be between 10 and 30 times higher than in poorer countries (ITU, 2003), and in most countries, Internet users are predominantly urban (Human Development Report, 2001)

Any support that could be provided to the C3D centres to overcome such barriers to online tutorial activity might facilitate the kinds of pedagogical opportunities explained in section 2. In particular, UNCTAD (2003) provides good evidence that "leapfrogging" in mobile telephony is possible: the implications for distance education in some countries could be a dramatic jump from the first generation to the fifth generation (see section 2.9 above, and also the scenarios section 3.7).

As we have indicated above, different pedagogical approaches call for very different skill-sets. This highlights another barrier: the recruitment or training of tutors with the appropriate subject knowledge and technical skills (Ondari-Okemwa, 2002). Using different tutors for different topics has the advantage of a diversity of experts and facilitators; however, steps then must be taken to ensuring coherence across a programme.

An important aspect of tutor support is suggested by ENDA: "it's the objective of the pedagogic tool in order to avoid a tutor who only reads the presentation to the students".

It should not be assumed that learners and tutors are confident about text-based synchronous conferencing, especially in countries that do not have a history of online communication. Participants in online learning may need to upgrade their ICT skills before they start a course, to enable them to communicate effectively online. In any case, there should be some kind of support desk for the inevitable problems.

We note that in answer to the question "How did you learn what you know", the response from MIND corresponds very closely to the mixed model we propose above of private study, participation in a community, and workshops. ERC adds "courses at various universities" to the list; and (as we indicate sections 2.18 and 4.6 above), the OU provides a number of international courses that might (in topic areas for which the C3D centres do not currently aim to develop courses) complement C3D provision without in any way detracting from the central mission of building capacity in developing countries.

At the OU, we have learned that there are more issues relating to online tutoring than simply knowledge and skills in the subject area and in technical matters.

For example, text-based electronic discussions tend to be more extended over time and wordier than traditional face-to-face teaching; and more continuous than traditional distance teaching. This means that tutors run the risk of a substantially increased workload. Feedback from tutors on OU courses which use computer conferencing, shows that tutoring online is perceived as more time consuming and that learners are perceived as more demanding than on traditionally tutored courses.

The expectation of ERC is that the workload is high in the production phase of the course, as the course developers grapple with the demands of producing materials that exploit ICT; but that the presentation phase of the course has a lower workload.

We would suggest then that in addition to new technical skills, tutors also need group management skills to promote effective online interaction that keeps their workload

manageable? Expectations about what kinds of input learners can expect from tutors also need to be made clear to learners. In particular, is it reasonable for tutors to respond to every message? How many times a week can they be expected to log in? Are tutors responsible for answering technical problems? Tutors may feel the pressure of unknown expectations, uncertainties about the role and excessive workload. They may need reassurance and support from experienced tutors in strategies for dealing with unfamiliar worries.

Learners may also experience such difficulties. Online study can provide learners with more encouragement to engage in learning through discussion and collaboration than in either traditional face-to-face teaching or traditional distance teaching. This means that some learners may be uncomfortable with these new modes of learning. Indeed, learning by rote is a preferred model in some cultures, and (as has been discussed in earlier sections) the idea of questioning the teacher or materials offensive. Even those students who find they enjoy the challenge of these new learning strategies may need reassurance and additional study support.

Business model

We included this question more as a prompt to the centres to ensure that they are considering the sustainability and growth-potential of their capacity-building than as an attempt to provide insights (into the differing missions of the respective centres) that would shape this report.

However, there are important aspects to this sustainability and growth-potential that can be elaborated using Kenya as an example.

Juma (2003) reports that student demand for university places in Kenya outstrips both the supply of qualified faculty, and the funds available for lecture halls, student housing, and educational materials. Juma argues that countries in sub-Saharan Africa (SSA) need many more graduates, especially in science and engineering; and these graduates need greater entrepreneurship, creativity and skills in critical thinking and problem solving.

Bawa (2004) describes the growing understanding by governments and multilaterals of the importance of higher education. However, educating students abroad is an unsustainable option if higher education is to expand. So, according to Juma, it is “highly questionable whether tertiary institutions can afford to continue to develop under this traditional model of higher education.” (p. 6).

The Kenyan government, as with many developing countries, therefore sees new educational technologies as a potential solution to this problem of access to affordable mass higher education.

As the C3D project partners will be aware, the objective of the African Virtual University (AVU), based in Kenya and with learning centres in 19 African countries, is “to build capacity and support economic development by leveraging the power of modern telecommunications technology to provide world-class quality education and training programs to students and professionals in Africa.” (AVU, 2005). The AVU works in collaboration with African Universities to identify academic needs, and to provide

courses to address these needs. Funded initially by the World Bank, it is now an independent non-profit organisation.

The AVU is tackling a number of problems left-over from the original way the pilot study was setup; but there are also a number of objections that have been raised in relation to sustainability and expandability.

Firstly, Amutabi & Oketch (2003) question the wisdom of the particular technological solution chosen. Courses are transmitted to learning centres in participating institutions by satellite (at US$1000 per hour). Instruction at the learning centres is supplemented by video, textbooks, software, a digital library and course notes. Interactivity is provided by phone, email, internet-based discussion forums, and audio-conferencing. So the telephone is critical to the delivery model, in a continent that has much less than a tenth of the telephone landlines available to Europe or the Americas (Murphy et al, 2002), and mobile telephone coverage that varies dramatically between urban and rural areas. Amutabi & Oketch note that Kenya is 80% rural and has an unreliable telecommunications infrastructure. This urban-rural divide is of particular relevance to ENDA, based as it is in a country in which (according to ITU, 2003) just 2% of rural households have electricity.

Secondly, Amutabi & Oketch are also critical of the decision to locate the learning centres on university campuses that are already "overwhelmed with problems related to access, finance, quality, efficiency" (p. 71). Juma notes a central dilemma for the AVU: If AVU learning centres are administratively separate from the partner university, they function outside the mainstream activities of the university, and are thus seen as quirky and, potentially, as a competitor rather than as a partner. If their finance, planning, management and administration are integrated into the host university, decision-making processes will be used that might be appropriate for face-to-face or traditional distance education courses but that might not be appropriate for virtual teaching.

Thirdly, demand *still* cannot be met: at Kenyatta University, Nairobi, for example, "the demand for AVU courses has been so great that for the past three years only 5 per cent of the demand could be fulfilled." (Juma, 2003, p. 8). Yet Amutabi & Oketch also point out that the numbers of students who can afford the fees are relatively small.

Fourthly, it is difficult to recruit and retain local facilitators who have skills in computers or business (Ondari-Okemwa, 2002).

Fifthly, it is unclear yet whether its university-level degrees (as opposed to its computer short courses can establish a sufficient revenue stream to achieve a programme of upgrading the technology initially provided by World Bank funds.

Finally, there is concern that the content of the AVU's courses is, at this time, entirely sourced from outside Africa. So, for example, the AVU offers Computer Science degree programmes from the Royal Melbourne Institute of Technology in Australia and from Université Laval in Canada; a Business Studies programme from Curtin University in Australia; and eight to ten week certificate short courses from Georgetown University, New Jersey Institute of Technology (NJIT) and Indiana University of Technology.

The concern here about outsourcing is several-fold. In the first place, the question arises as to whether the content and pedagogies of the courses are sufficiently adapted to an African context. Moreover, at the moment, by buying in courses from outside Africa,

some might claim that the AVU inadvertently perpetuates the myth (Bawa, 2004) that "Africa's problem" is that it lacks the superior knowledge possessed by richer countries. Most important of all, the model provides only limited enhancement of African academics' course creation skills. For each programme, one of the African institutions works with the content provider to take over the accreditation and running of the programme. However, so far, the AVU is not exploiting the capacity-building potential of the community tools, discussed in section 3 of this report, for sharing pedagogical knowledge and for international collaborative course development.

So, as the C3D partners will be aware, the question of the business model goes directly to the heart of the question of the sustainability and growth-potential of capacity-building, and hence of reducing rather than increasing dependency on industrialised countries.

Training materials development

Overall, one gets the sense of the C3D centres needing hands-on help with courses. We hope that the theory, empirical research, and practical experiences outlined in this report will at least be of some small help; but the centres would most value hands-on help. Indeed, feedback from partners on the 29th November draft study produced a single clear need to be fulfilled – that partners wished to develop their in-house e-learning capacities. ERC and MIND have both expressed their desire to go further in any next phase.

In the current phase, the OU's terms of reference did not include (and could not have included) the transformation of learning objects from partners into OU quality e-learning products.

But if we imagine for a moment that we had done, we can ask what use would this have been to partners. We accept 100-200 pages of text/presentations/spreadsheets and then 1-2 months later we email or post back a CD the prototype tools/chapters as e-learning objects. Partners would learn simply that they can send materials to the OU and these are then transformed. Clearly this would not help partners develop their in-house e-learning capacities.

An alternative scenario is if an experienced e-learning developer (from the OU or elsewhere) worked on the transformations at each centre, or if the centres were to send staff to work with a developer. Partners developers could "watch over the shoulder" to see how the process works, and through such means aim to acquire the necessary knowledge and skills. However, how much could we expect would be learned in such a scenario? To gain a working understanding of the elements of course production takes around 3 years at a minimum (this is dictated by typical course production cycles). Add in first year presentation and another for orientation and the figure now looks like 5 years. So this is not a realistic option.

In order to identify the form in which assistance might be provided in related to teaching materials development, it may be helpful to use a simplified model of the main units of course production and presentation at the Open University (given in further detail in section 2.17 above):

- **Central Academic Units (CAUs)**: These are the faculties/departments of the University. CAUs provide a variety of human resource inputs including: academic

staff time; academic-related staff time; secretarial and clerical and technical staff time.

- **Learning & Teaching Solutions (LTS)**: LTS is the media production centre of The Open University. Its core clients are the University's Central Academic Units and its core business is producing learning materials. Specialists, covering the full range of media, work closely with academic colleagues to develop, produce and deliver effective, integrated and increasingly interactive materials.

- **Student Services**: Crucial interactions and relationships between the OU and students are managed through Student Services, both in Regional Centres and in the offices based at head office in Milton Keynes. The unit's core purposes are to provide teaching infrastructure and support for student learning. In particular this includes assessment services, credit and awards services

The Open University is currently developing complex costings models that take into account the resources costs of producing courses across these functions. The main elements of interest for the C3D project are in the following areas:

- how central academic units work to produce learning materials including paper scripts and sketches of ideas that need to be turned into e-learning materials
- examples of estimates of the time inputs that LTS estimates is required to translate different types of materials into e-learning products

In translating the OU model to the contexts of the C3D partners it may be helpful to think in terms of filling 3 capacity gaps:

1. The “instructional design capacity gap” – the extent to which centres feel they would like to boost their capacities to produce suitable learning materials.
2. The “production capacity gap” – the extent to which centres feel they wish to boost their capacity to translate paper materials, scripts and ideas into suitable e-learning materials.
3. The “presentation capacity gap” – the extent to which centres feel they wish to boost their capacity to provide supported open learning, i.e. to be able to interact with and support students studying at a distance.

Addressing the instructional design capacity gap

As discussed earlier in the report, the OU’s instructional design largely happens in “course teams”. Vital roles in course teams are the Course Team Chair, authors and the Course Manager (please see details of these roles in section 2.17 above). It is likely that the C3D centres have sufficient capacity with respect to these roles, and that the roles can be matched with existing personnel.

However, the OU’s notion of the “Critical Reader” role offers a well-defined way of providing targeted assistance that can be conducted by people outside the centres. The idea of a “Critical Reader” is of a friendly reviewer, who by commenting on draft materials at various stages in the production cycle is able to help the course developers improve their materials. To be of maximum benefit to the C3D centres in building their

capacity to exploit ICT for training, Critical Readers should be experienced in the development of courses that make extensive use of ICT, and also familiar with the subject matter.

MIND indicated the view in the questionnaire that continuous learning can be effectively encouraged by reviews of material. The Critical Reader role would provide this explicitly. ENDA alludes to the problems of integrating new human resources into an existing operation, and we suggest that this role represents a "short cut" to integration. A proposal to fund Critical Readers also help to address ERC's expressed need for funds and additional staff. It would be important for the funding for these roles to have few strings attached.

The proposal to fund Critical Readers for the centres addresses three aspects of the centres' needs:

Improving the materials: Firstly, the comments on existing materials enable the quality and educational effectiveness of these particular materials to be improved.

Improving the design: Secondly, comments on the way the materials are used with students or trainers enable the quality of the particular pedagogical design to be improved, again leading to improvement in educational effectiveness.

Building in-house capacity: Thirdly, by studying the comments of Critical Readers, the course developers will improve their skills in designing and producing effective training, following the cognitive apprenticeship model (described in section 2.15 above). This, then, is our suggestion for the main means by which in-house e-learning capacity can be established. This apprenticeship could be supplemented with further study, such as via the OU's global postgraduate courses in online and distance education, which can be studied anywhere with a fast, reliable internet connection. Additional funding from a third-party would likely be needed for course fees, however, as these are very large by the standards of many developing countries.

It would fit well with the aims of the C3D project if Critical Readers could be identified in developing countries. This way, the C3D centres gain expertise from the expertise of others in this area, and further developing countries are brought into the capacity-building mission. In turn, those who improve their skills in developing e-learning will be able to act as Critical Readers to others, and so on.

Addressing the production capacity gap

In section 2.17 above, a number of production roles were outlined, including library staff, media assistants, programmers, designers, AV staff, project manager, editors, artists, testers, and production managers.

For small-scale projects it would be possible to combine many of the roles into a single "Media Developer" role. Such a person would need to be able to develop software, websites, and audio-visual components.

As with the proposal to fund Critical Readers, funding Media Developer time for the centres offers a well-defined way of providing targeted assistance. All three centres have referred at various times to custom software and applet development as being a desirable part of the resources they want to develop. For anything other than simple spreadsheet-

based applications, media developers who have the requisite skills in web-based development would be essential. We believe the C3D centres would benefit greatly from additional funding to buy media developer time.

It is not easy to develop in-house expertise in media development without recruitment. In the UK, junior Media Developers usually have a minimum of a computer science degree, with industry certification in one or more programming languages or other technical specialist areas. More senior Media Developers have several years of experience, and often also have postgraduate qualifications.

However, like Critical Readers, Media Developers can usually be based anywhere in the world that has a fast, reliable internet connection. In the UK, for example, many of Vodaphone's programmers are based in India.

Addressing the presentation capacity gap

We have already discussed tutorial activity in some detail above. Support for new tutors might best be provided by shadowing experienced tutors, and supplemented by one of the OU's courses that focus on online tutoring (available at both undergraduate and postgraduate level).

Concrete examples of resource inputs

The process of OU production of e-learning materials was discussed in Section 2. This however does not provide an indication of the levels of human resource inputs required at each stage. The C3D partners have expressed an interest in more concrete information on for example, how MIND's AIM tool could be transformed it into an online resource (including the level of work needed in terms of man/month, qualifications/training needed).

We conclude our report, therefore, with some concrete, but indicative examples of resource inputs the OU experiences and an attempt to translate these to examples of C3D learning materials. The caveats mentioned in Section 2 with the respect to the transfer of experience from the OU model of course production and presentation also apply to the issue of resource inputs. It cannot be stressed too highly that the OU is a unique institution operating on an industrial scale of e-learning production. In response to partners' interest we have gathered together new information on our resource inputs in an attempt to provide partners with an indication of the resources the OU would require to produce e-learning objects from C3D learning objects. Please note this is in no way to suggest that we are in a position to consider offering this service. We are not in such a position.

Indicative examples of resource inputs to course production

First here are some examples of the resource inputs from the point of view of the Central Academic Units (referred to in Section 2). They are taken from the Faculty of Technology and cover a range of types and complexities of courses.

However first it is necessary to provide a short description of the units we use to quantify the amount of learning in a course. The OU works in units of full credits, half credits. Course production works with "units of teaching" or "units of teaching equivalent". Full

credit course is equivalent to 60 points or 600 hours study. This is, in turn, equivalent to 32 units (week's worth or roughly 20 hours study time) of study or "unit equivalents". 1 unit equivalent of teaching is in turn equivalent to around 48 pages printed material A4 single spaced, 12 pt

The following three examples of different complexities of course do not include dealing with copyrights, picture research, audio and video production etc.

Example 1: Faculty of Technology Indicative Resource Inputs (Per average full credit 60 point course)

Editing	2144 - 2640hrs depending on complexity
Graphic Artist	0 - 1920hrs depending on number of illustrations and complexity (could be in excess of this depending on the subject).
Pagination	450 - 1120hrs depending on complexity.
Software	0 - 1000hrs depending on what's required.

Example 2: Faculty of Technology Indicative Resource Inputs (for a 60 point complex technology course with a full media mix)

Editing	2640hrs
Graphic Artist	1200hrs
Graphic Design	150hrs
Pagination	600hrs
Software	500hrs
Web	200hrs

Example 3: Faculty of Technology Indicative Resource Inputs (for a more straight forward technology course with say 10 illustrations per unit equivalent (320 illustrations per 60 point course):

Editing	2200hrs
Graphic Artist	320hrs
Graphic Design	50hrs
Pagination	450hrs

Recently the OU has been experimenting with very rapid development of very small courses (10 point or 100 hours of study). These are being produced in an entirely different way using standard software templates and models for e-learning via the web. They do not involve the production of any written materials other than the 60,000 words of so on the web. As a result, the resource inputs for such courses are much less:

Example 4: Indicative inputs to the production of technology short courses (10 points or 100 hours study):*

	Simple (mostly text based, some interactive)	Complex (lots of multi-media/interactive)
Academic input	3 months	9 months
Course Manager	0.5 month	1 month
Secretarial input (mainly to cut and paste from Word into Xmetal - our xml editing tool.)	0.5 month	0.5 month
Consultant input	0.5 months (e.g. Critical Readers)	1 month

*In addition to these Faculty CAU inputs, there are of course production inputs from LTS. These are approximately pro rata those of larger courses (e.g. divide inputs for a full credit course by 6 for a 10 point course to get and ideas of these). The full cost to the University must also take into account costs from Student Services (exams, CMAs, registrations etc), Library etc. (roughly £145 per student).

OU LTS' perspective on indicative estimates of resources inputs required to produce units of teaching in different media and at different levels of complexity is presented in qualitative terms in Table 7.

An overall summary of the OU's estimates of the range of LTS hours of input required to produce 1 study hour (from simple to complex cases) down the categories shown in Table 7 is as follows:

Print: 27-90 hours input per hour study time

Offline resource collection: 5-15 hours input per hour study time

Offline tools: 1-5 hours input per hour study time

Online resource collections: 4-18 hours input per hour study time

Online web-assisted learning: 4-30 hours input per hour study time

Typical student numbers over the life of a course (up to 8 years) can reach 10-20,000. The ratio of input hours per cumulative hour of study time must therefore be adjusted by up to a factor of 4 or more.

Table 6: Indicative estimate of resources inputs required to produce units of teaching in different media and at different levels of complexity

Medium	Simple	Intermediate	Complex	Extra complex
Print	Text: existing styles or few styles used, existing design, single colour, single column. Artwork and design: few illustrations or tables, all simple (<5 per 24 pages); no graphic features; autoflow text; previously published materials. Photo/scanning: up to 20 b/w scans, photographs or text/articles for offprints.	Text: some new styles within existing style sheet; adapted design; single, 2, or 4 colour; single or double column; standard range of activities, examples etc. Artwork and Design: medium amount of simple to complex illustrative and tabular material (av. 10 per 24 pages); few graphic features; mainly autoflow text; tables and illustrations a regular but not heavy element; some specialist or technical knowledge required, e.g. in checking calculations. Photo/scanning: colour scans where colour is not critical; between 20 and 50 photographs and scans.	Text: new styles, most used throughout; new design; single, 2 or 4 colour; single or multiple column; wide range of learning and teaching features, including extensive cross-referencing. Artwork and Design: large number of varied, often complex illustrations or tables (av. 20 per 24 pages).; many graphic features; manual layout; specialist or technical expertise required throughout. Photo/scanning: colour scans where colour is critical; up to 50 scans and photographs requiring colour separations and acquired from agencies or other sources.	Text: new style sheet with complex styles/structure; new design; 2 or 4 colour; multiple columns. Artwork and Design: complex and varied Illustrations or tables prominent (>25 per 24 pages).; many graphic features; manual, hand-crafted, page layout; very complex work likely to be in colour; maps. Photo/scanning: colour scans where colour is critical; over 50 scans and photographs requiring colour separations and acquired from agencies or other sources.
Audio cassette/CD	Simple studio discussions for 30 minute audio production. No location work. Little editing required.	Audio requiring some scripting and some editing. Some location recording required	Audio requires full scripting and producing with editing, effects and dubbing together with location negotiations	N/A

Video cassette/DVD	Simple non-lit shots with little editing or dubbing in studio or on local locations; screen based, web streaming.	Video requiring some scripting and some editing; some location shooting required; full motion, full screen output.	Video requires full scripting and producing with editing, effects and dubbing together with location negotiations; broadcast quality.	N/A
Offline CAL	Small amount and simple blocks of textual content; simple buttons and graphical elements; no audio or video assets.	Small blocks of text distributed in set places within the program; simple drawings and scans in repeated location within the program; few and short audio and/or video assets.	Large amount of text assets requiring editing and distributed throughout program; complex drawings repeated in locations within the program; multiple audio and/or video assets .	Multitude of text assets distributed disproportionately; many complex drawings in different locations within the program; multiple audio and/or video assets involving complex interactivity.
Offline resource collection	Simple CD-ROM containing files of resources. Most resources already produced or acquired externally. Use of existing shell or template to hold the resources.	CD-ROM containing both externally acquired and internally produced resources. Some programming required to modify shell or template. Simple commercial program used for creating assets of resources on DVD or DCVD ROM.	Many internally produced assets. Programming required to customize shell or template with overall theme or intent. Interaction between assets. More complex programming required for interaction when on DVD or DVD ROM.	N/A
Offline tools	Simple provision of third party software installer on CD-ROM, requiring little testing.	Provision of software installer with data set or activities files to be completed by students, where the use of the files by the software needs to be tested.	Provision of software installer with data set or activities files of extra complexity or number to be completed by students, where the use of the files by the software needs to be tested.	N/A

Offline other	Please refer to the LTS Media Account Manager for costings for this item.	Please refer to the LTS Media Account Manager for costings for this item.	Please refer to the LTS Media Account Manager for costings for this item.	Please refer to the LTS Media Account Manager for costings for this item.
Online conferencing	This is a standard charge relating to the initial set up costs associated with conferencing and student authentication onto the University's computer network. On-going costs are dealt with in a separate area.	This is a standard charge relating to the initial set up costs associated with conferencing and student authentication onto the University's computer network. On-going costs are dealt with in a separate area.	This is a standard charge relating to the initial set up costs associated with conferencing and student authentication onto the University's computer network. On-going costs are dealt with in a separate area.	N/A
Online resource collection	Simple web site containing files of resources. Most resources already produced or acquired externally. Use of existing web site design to hold the resources.	Web site containing both externally acquired and internally produced resources. Some modification of existing web site required. Some programming required to create interaction between assets.	New web site for container of resources. Many internally produced assets. Requirement to create overall theme or interaction between assets.	N/A

Online web-assisted learning	Simple site structure; choice of colour and branding using an existing or simply adapted design template; minor adaptation of or addition to site text; small set of pdf resources and links to ROUTES; standard calendar; little editorial or design input beyond that agreed for other media but necessary for integrity of site. Note: there is a separate costing for eDesktops	Includes style customisation options with some new site structure and content; more extensive resources including text, simple scripted activities, simple database driven resources as well as a fuller range of pdf resources; some service links to calendar, a small amount of editorial and design involvement for checking texts and producing site graphics.	Significant structural as well as style customisations with new site content; interactive materials - and a range of resources including significant scripting of activities and database driven resources and customisation of content for the user; time driven services; full study diary with linkages to materials; more detailed and extensive editorial and design contributions.	Bespoke site designed and built from scratch. Site is the primary learning environment; content created for substantive study online involving significant content development and support systems. Extensive customisation dependent on user.
Online other	Please refer to the LTS Media Account Manager for costings for this item.	Please refer to the LTS Media Account Manager for costings for this item.	Please refer to the LTS Media Account Manager for costings for this item.	Please refer to the LTS Media Account Manager for costings for this item.

Having described OU roles and production processes (section 2) and given indications of the resource inputs that are put into OU type courses above, it is now possible to give some indicative examples of the resource implications of translating some of the examples of learning objects generated in the C3D project. It must be stressed these are rough estimates and the best we can produce without engaging in undue detail. They were developed after discussions with a media developer with whom the team has worked on various projects including the production of tools for example to teach climate modelling (the OU's FAIR model decisions support software). He has a good working knowledge of C++ (and other high level programming language such as Java). However, like most of the Media Developers at the OU, he is employed also because of his subject area skills. He holds a PhD in science and few formal programming qualifications. He estimates the level of programming skills necessary for the production of e-learning materials are probably sub-degree level and mainly acquired through experience. In his view the ability to understand the course material and work at the same academic level as the course team is just as important as knowledge of learning design and programming ability. The OU experience is probably unique in this respect.

Table 7: Estimates for the development of selected C3D materials into e-learning products

Example	**Format and scope of materials to be converted**	**Detailed resource inputs required to produce OU-type e-learning materials (at the OU) – note that smaller younger organisations may be able to considerably reduce resource inputs**
ERC's chapter materials "introduction to greenhouse gas inventories" as sent	4 modules G, L, T page templates. 8G, 39L, 45T, 11pages from the EFDB user manual for WEB application (Version 1.00), 5 pages of UNFCCC guidelines for technical reviews of GHG inventories around 40 PowerPoint slides	Virtual learning environment "skin" to include all templates, spreadsheets, links to resources (e.g. extracts from chapters, manuals, COP decisions) (40 media development hours). This is a one off and could be used as standard for all ERC's modular training of this form. Development of template G, T and T screens (15 hours 5 hours per screen) L and T pages at 1 page per hour media development 2 examples of programming time needed to develop relatively self contained learning objects: Interactive GWP calculator incorporating various transpositions of units with wrong answer feedback (around 20 hours media development) Apparent fuel consumption interactive tool with wrong answer feedback (20 hours media development) Web version PowerPoint presentation (cut words by half, add voice over and possibly talking head) (10 hours media development, 10 hours academic input) Total including two tools above179 media development hours – 4 weeks programming time

Example	**Format and scope of materials to be converted**	**Detailed resource inputs required to produce OU-type e-learning materials (at the OU) – note that smaller younger organisations may be able to considerably reduce resource inputs**
MIND AIM tool documentation (as sent) Users Manual Preliminary Draft 2005	33 pages A4 text. 29 excel based tables, 2 diagrams, 1 excel spreadsheet	Many of the tables are very similar in programming demands. Once one has been done others are less time consuming. Assuming the following: a new table equivalent of 10. total number of screens 15 integration of spreadsheet functionality directly into the tool 75 programming hours (including testing) 20 total person hours audio scripting and recording total media development time approximately 100 hours This does not include "wrong answer" feedback functionality (to the extent there are wrong answers – but e.g. a score of greater than 5 entered is clearly wrong). The resource inputs for this would not be more than an additional 100 hours combined of developer and academic time.

5.4 Concluding remarks

The report has considered in detail what the UK Open University (OU) has learned about creating and running online courses, with a view to helping the C3D project team think about how ICT-assisted distance learning could be implemented. It has also examined the potential of knowledge management strategies to support the C3D project's capacity building, via the notions of communities of practice, learning organisations and competitive advantage. This work has been complemented by an online workspace in which members of the Open University C3D team have made their contributions to the project available to the C3D partners.

In addition, the report provides a review of tools, activities, resources and courses relevant to the C3D topics of climate change and sustainable development; and identified a gap in relation to packaged training courses supported by an online community.

Finally, drawing on a questionnaire and interviews with project partners, the report has identified general lessons in relation to capacity building in this area, as well as needs, opportunities and barriers in each of the three C3D centres in relation to the use of ICTs in pursuit of the project objectives.

Specific proposals have included:

1. the funding of Critical Readers to help improve the materials, to enhance the pedagogical design of teaching, and to build in-house course development capacity;
2. the funding of Media Developers, to develop software, websites and audio-visual components based on the work of the centres;
3. professional development for the centres' online tutors.

We very much hope this report will be a valuable tool in the development of strategies to increase capacity in climate change policy analysis and negotiation.

5.5 References

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Appendix: Questionnaire and face to face interviews with centres

Responses from each of the three centres were received and are presented below together with notes from face to face interviews carried out at COP10.

1. Who are the prospective students?

ENDA: Today (with our pedagogic tool in construction), there are no direct prospective students, only trainers to learn using this pedagogic tool. For online course, each trainer with the same logic/approach "has to build its own tool".

MIND: Managers in government, NGO's, Private sector that have some interest in climate change and sustainable development

ERC: Climate change policy analysts from universities, NGOs, consultancies, the utility, business

- Government officials

- Members of the National Committee on Climate Change (NCCC)

2. What are the educational aims?

ENDA: The educational aims are to use the tool in different ways because each trainer has to adapt the tool or to rebuild a tool according to each targeted audience.

MIND: Awareness and training on climate change & Sustainable development issues

ERC: Generally the aims would be to provide an understanding of climate change that will enable improvement in policy-making and more effective negotiation

- The course would result in capacity-building of the students

3. Is the business model sound?

ENDA: Yes, it seems to be.

MIND:

ERC: Yes!?

4. Who is going to tutor on the course?

ENDA: The trainer of each training session

MIND: If country level courses are developed, the partners would lead the tutoring

ERC: ERC staff?

- Will we opt to have a tutor? Still needs to be thought about further

5. How did you learn what you know? How best might you learn it if you could take this course? Might other people learn it best in a different way?

ENDA: No answer

MIND: MIND is a lead agency in Sri Lanka dealing with climate change and sustainable development issues. Gained knowledge from various papers and books and attending various meetings and conferences Interactive sessions and workshops would be helpful.

ERC: Variety of ways e.g. attending COPs, courses at various universities, by doing relevant research, teaching on masters courses, on the job, by example

- The course should be tutorial based with exercises

- Yes, others may learn best in a different way

6. What activities could students experience?

ENDA: All depends of the targeted public which can cover all this type of activities which are currently not defined.

Type of activity

receiving information

resource-based learning

problem-based learning

narrative-based learning

communication with peers

communication with tutors

collaboration

practical activities

software

assessment

MIND:

ERC:

Type of activity	***Opportunities in this course***
receiving information	*Slide presentations (e.g. PowerPoint), readings, interactive website?*
resource-based learning	*Role plays*
problem-based learning	*Assignments (e.g. mitigation costing exercise)*
narrative-based learning	*?*
communication with peers	*? in small groups? Indirectly?*
communication with tutors	*Electronically*
collaboration	*?*
practical activities	*Assignments*
software	*GHG inventory software, mitigation exercises (e.g. excel spreadsheets)*
assessment	*Through assignments, other means?*

7. What mix of technologies is appropriate for this course?

ENDA: Ppt, hand book, guide, internet

MIND: Innovative technologies such as teleconferencing, newsletters, websites, email updates, CD's and video material

ERC: Slides, text, webpages, sound?, other? Uncertain

8. Is the workload for course designers, tutors and students reasonable?

ENDA: Once the tool is built, I think the workload is important for the tutors; it's the objective of the pedagogic tool in order to avoid a tutor who only reads the presentation to the students

Becoming a Community of Practice for the community of practice that is the C3D team

MIND: yes

ERC: We'd need to find that out. Initially the workload would probably be quite high (the setup could take some time, especially as we still need to develop the expertise). Thereafter, once the course is running, it would be response-based so perhaps lower.

9. What is the purpose of the community?

ENDA: To make available a training tool to others members. As each centre is specialized in a particular field, the objective is to make available to the other centers specific knowledge pertaining the related field, namely: references material, case studies, simulations, web sites, etc (this information is already largely available on the specific web sites of C3D centers). In the case of ENDA (V&A), a mapping of V&A is available for use by the partners.

MIND: To share knowledge and experience with different aspects of CD – adaptation, mitigation, and issues of climate change& sustainable development

ERC: To provide human and intellectual capacity to address climate change mitigation, adaptation and sustainable development. Explicitly it is south-south co-operation.

10. What external groups does it communicate with?

ENDA: Many groups according to the field experience of each center

MIND: IPCC, Local government sources, researchers

ERC: government, other climate change focused organisations, climate change stakeholders, negotiators, energy researchers, NGOs etc.

11. What knowledge does the community need to capture or share?

ENDA: Basics and pedagogic tools on each field.

MIND: Local experiences, best practices, future projections, localized predictions, pilot projects.

ERC: Mitigation, vulnerability & adaptation and sustainable development pedagogical material aimed at climate change policy-making

12. What mechanisms are currently used to share knowledge?

ENDA: Hard paper, ppt, email, website.

MIND: Email, CERN website, newsletters, meetings, workshops

ERC: The platform, email, meetings and workshops, telephone, occasionally the webcam & messenger

13. What new mechanisms or tools would help knowledge sharing? Who can contribute? Is there a fit with existing practices?

ENDA: I think the interactive platform is a good tool when each partner use it regularly. It's not a fit just an evolution. To share as well as possible, knowledge must be classified, categorised and ordered, and accessible in order to be directly usable either for studies, or, more importantly for teaching objectives with the provision of generic teaching aids (a work currently in progress with ENDA for V&A).

Becoming a Learning Organization for the C3D team

MIND: Teleconferencing,

ERC:? We haven't thought this far yet

14. How is knowledge sharing valued?

ENDA: No answer

MIND: Very useful

ERC: Between partners one could perceive this as being fairly low up to this point, as our feedback on materials has been slow and thin – it works only when both partners need to share knowledge

- From our perspective it is valued quite highly

15. How is continuous learning encouraged?

ENDA: With the will to develop an endogenous dynamic

MIND: Constant interaction and review of other centre's material and comments. Providing material relevant to other institutes

ERC: Conferences and workshops

- Continuing training

- Through teaching

16. How are individuals' contributions valued?

ENDA: Individually, not now directly but inside the team

MIND: Very highly

ERC: High?

17. What opportunities are there to reflect on past failure and successes?

ENDA: To build ''generic'' tool and not a ''ready made tool'' because a ready made tool can be used by everybody (even without background in the field) which leads too many failures in the results

MIND: All centers should share their ideas, successes failures and best practices so that others can learn from experiences.

ERC: Not many, but evaluation would be beneficial

18. How do you learn from other organisations?

ENDA: By exchange of documents, discussions and by mails

MIND: From newsletters, email communications, papers etc

ERC: Sporadically – through reading a published paper, through attending meetings and workshops etc.

19. How are individuals encouraged to take risks with new ideas?

ENDA: When you are in a context of no future, you have an interest in taking risks with new ideas, and not to reproduce systematically the dominant ideas, which is the most difficult to share

Exploiting Competitive advantage for the C3D team

MIND: Support given for publications. Ideas can be exchanged and comments shared. Innovative presentations.

ERC: Generally they aren't encouraged

20. Who are the competitors?

ENDA:

MIND: None that we are aware of

ERC: Other consultancy groups in South Africa (e.g. CSIR and MEETI)

21. What are the long-term objectives?

ENDA:

MIND: Train government, private sector and civil society about the impacts, vulnerabilities, adaptation options, mitigations options to climate change, and how climate change could be included in policy making.

ERC: C3D is not a long-term project as yet (the current phase ends in August and extension is not a guarantee)

22. What advantages does the C3D team have over the competitors?

ENDA:

MIND: Direct links with IPCC and other climate related institutes, instant update of information, clear links with each other

ERC: University based and varied expertise and experience

23. What external factors affect the C3D team's ability to compete?

ENDA: ENDA is in a phase of developing its human resource capacities and expanding its potential human resources (internal and external); the barriers thus cannot be broken up into financial, administrative, technical or logistical aspects but in

o "production time frame" for the human capacities,

o "absorption capacity timeline" by the ENDA for new or anticipated human resources

o "integration speed" of new human resources.

ENDA is thus faced much more with the constraints of a classical development cycle, for which short cuts (leapfrogging) are currently required / looked for.

MIND: Recognition of expertise by government systems

ERC: Funding (often it is too short-term)

- Some work requires government approval

- Office environment (no airconditioning in summer!)

24. What resources (skills, assets, finance, relationships, technical competence, facilities) would help you compete better?

ENDA: The group can help, mainly by trying to understand and integrate the specific "development cycle / phase" of the other members of the group. In other words, the group's requirements should not constitute new barriers to the development of one member of the group, as this would then become counter-productive for the group as a whole.

MIND: Relationships with scientific bodies need to be enhanced, exposure to latest research findings.

ERC: Core funds

- New, young staff and students

- Additional experienced staff

- Stronger links with leading international researchers and organisations

Interviews with the three centres at COP10

ENDA

Jean-Philippe emphasised that ENDA as an organisation as a whole is currently in a phase of reflection on its future approach and strategy towards developing distance learning. ENDA currently uses email and of course has its extensive web site which is used to host documents. It is now reflecting on how to move from an "email + website" model to "real e-learning". It has identified that there is a capacity gap in moving from one to the other but would like more time to consider the resources needed. One of the more advanced applications of e-learning that ENDA is aware of is through the activities of LEAD Francophone Africa based at ENDA.

We spoke to various staff of LEAD based in the UK. Here is an extract from their web site explaining their approach to distance learning in the context of the LEADnet activities:

Enseignement à distance : LEAD international a développé un système de formation multimédia basé sur son curriculum qui peut être utilisé individuellement. LEAD a également développé des études de cas disponibles en format numérique. Le développement des aptitudes d'utilisation des technologies de l'information fait partie intégrante de la formation offerte par LEAD, particulièrement dans les régions où de telles connaissances sont peu développées. LEAD fournit d'ailleurs l'équipement informatique nécessaire aux membres des pays en développement qui n'en disposent pas.

http://fa.lead.org/leadnet.asp?cible=leadnet

LEAD Africa, like its international network, trains working associates who become LEAD fellows and continue to communicate and interact after their training. They form a club with 2/3 fellows from each of the eligible participating countries (15). LEAD ENDA was chosen by Tony Blair to develop 3 workshops relating to NEPAD. LEAD international have developed two courses. The Masters in Professional Studies in collaboration with Middlesex University is in its first year. But this is not distance learning. http://www.lead.org/mastprog/MP_Prospectus.pdf

The Masters in Sustainable Development in collaboration with Imperial College began in February 2005 and has 90 students in its fist year. Ran by a group of 12 academics at Wye College:
http://www.imperial.ac.uk/distancelearning/course/new.htm

LEAD international have produced a set of offline learning resources that are available on their website at
http://www.lead.org/Publications/default.cfm?target=LearningResources

These are all currently off line (CD-ROM) training packages.

One online tool is being developed (on the topic of proposal writing) in collaboration with SD learn. This will comprise synchronous/asynchronous communication and activities.

We contacted LEAD international to ask them what level of resource inputs went into their interactive CD-ROM learning materials.

“Exploring the Intergovernmental System” is a CD-ROM-based training module designed to expose learners to key issues, challenges, features and functions, and the political dynamics of the intergovernmental system. The module also contains discussion questions and a mock negotiation, which can be used in a workshop setting, to help participants understand the operations, architecture and influence of global governance organizations. According to LEAD, the purpose of developing this CD-ROM was to develop leadership skills and knowledge about the Intergovernmental system and the target audience was LEAD Associates and mid-career decision makers.

Here are the time inputs that LEAD estimates went into the development of this product:

content:	4 weeks
editing:	2 weeks
admin and proofing:	3 weeks
testing:	2 weeks
technical:	4 weeks

MIND

Mohan emphasised that MIND has the classroom capacity but it is traditional face to face expertise. MIND can see two specific aspects where it would like to grow

- An e-learning capability in house as a target for phase 2
- It would like to make the AIM (Adaptation Impact Matrix) tools available more openly via the web

ERC

Harald suggested that it would better help the partners in any future phase if they could be directly involved in the translation of small modules into examples of e-learning. Clearly this was not possible in the current phase as the learning objects themselves had not been developed and therefore could not be specified for media development. Any subsequent phase of the C3D project could have as one of its goals the translation of specific C3D learning objects (e.g. the AIM tool, ERC’s mitigation training modules such as the CDM module and the inventories module, ENDA’s V&A tool).

Administration components

The aspects of a course that enable students and their tutors to undertake administrative tasks. Examples include enrolment, calendaring, news and record management.

Applet

An applet is a small application: a limited piece of software that typically runs inside a browser on a user's computer.

Appropriability

The extent to which something can be imitated. Things are said to have "strong" appropriability if they are difficult to reproduce by another organization. The converse is "weak" appropriability.

Behaviourism

In psychology, the view that observable behaviour should be the focus of research. In education, it is the view that conditioning is central to learning.

Blogging

The use of a "web log" or "blog". This is a web-based publication consisting primarily of date-stamped periodic articles (normally in reverse chronological order). Blogs can be personal or collaborative. Many blogs enable visitors to leave public comments or ratings, which can lead to a community of readers centred around the blog. Blogs are usually browser-based and can be created using a variety of tools.

Collaborative working

A generic term that simply means teamwork or a group effort. It also has a more specific meaning in knowledge management, where it is often used to describe close working relationships involving the sharing of knowledge.

Collaborative learning

Colleagues learning together, or students working together. This typically involves solving some kind of task, developing understanding, a solution or a product.

Communication components

The aspects of a course that allow students to interact with each other and with their tutors. They can use technologies such as asynchronous text-based conferences, instant messaging, blogging, email, audio-conferencing, video-conferencing, shared whiteboards, and document discussion tools.

Communities of practice

A self-organized, deliberate collaboration of people who share common practices, interests or aims and want to advance their knowledge. When the community proves useful to its members over time, they may formalize their status by adopting a group name and a regular system of interchange.

Competitive advantage

A widely-used term to describe the unique blend of activities, assets, relationships, history and market conditions that an organization exploits in order to differentiate itself from its competitors, and thus create value.

Constructivism

The view that learning is not the authoritative transmission of knowledge from teacher to student, but an active process in which learners construct new concepts based upon their existing knowledge.

Course team

A group of academic and other staff with the task of designing and/or producing and/or presenting a course.

Differentiation

Differentiation is the adjustment of the teaching process according to the learning needs of the students. “Differentiation by task” means setting different tasks for students with different prior skills and knowledge. “Differentiation by outcome” means setting open-ended tasks that allow students with different prior skills and knowledge to respond at different levels.

Expertise directory

A staff directory in the form of a database that includes details of people's skills, knowledge, experience and expertise so that users can search for people with specific know-how.

Double-loop learning

People fundamentally reshape their patterns of thinking with the intent of helping them learn to do different things. Double-loop learning questions existing assumptions in order to create new insights. For example, take the problem 'how do we prevent earthquakes from killing people?’ The single-loop answer would be to learn how earthquakes happen and try to predict them in order to be prepared. The double-loop answer would question our notion of 'earthquake' and might conclude that earthquakes do not kill people, falling buildings do.

e-learning

Literally “electronic learning” (i.e. learning through the use of devices based on computers and other electronic devices). Sometimes used to refer just to web-based or internet-based educational opportunities.

Explicit knowledge

Knowledge that can be easily expressed in words or numbers, and can be shared through discussion or by writing it down and putting it into documents, manuals or databases. Examples might include a telephone directory, an instruction manual, or a report of research findings.

Formative assessment

Assessment in which the main aim is to provide feedback to students on their progress, or to provide information for teachers on students’ strengths and weaknesses in relation to the learning objectives that enables the next stage of teaching to be planned. Complementary to “summative assessment”.

Groupware

Computer software applications that are linked together by networks, and so allow people to work together and share electronic communications and documents.

Feedback components

The aspects of a course that enable students to test their understandings. Examples include online multiple choice assessment, CD-ROM or DVD software, web applets and automated response systems.

ICT

Information and Communications Technology. Sometimes also known as IT (Information Technology) or C&IT (Communication and Information Technology). It is technology required for information processing and for communication, in particular the use of computers, electronic devices, software, and the internet.

Information audit

A method of reviewing and mapping information in an organisation. An information audit looks at things like what information is needed, what information there currently is, where it is, in what forms, how it flows around the organisation, where there are gaps and where there is duplication, how much is it costing, what its value is, how it is used etc.

Intangible assets

The non-physical resources of an organisation. An example might be the reputation linked to a brand name or the loyalty of customers to a company. These assets are not generally accounted for in an organisation's financial statements, but they are of great value to the organisation.

Intangible Assets Monitor

The Intangible Assets Monitor is a method for measuring intangible assets and a presentation format which displays a number of relevant indicators for measuring intangible Assets in a simple fashion. The choice of indicators depends on the company strategy

Intellectual assets

Those parts of an organisation's intangible assets that relate specifically to knowledge, such as know-how, best practices, intellectual property and the like. Intellectual assets are often divided into human (people, teams, networks and communities), structural (the codified knowledge that can be found in processes and procedures) and technological (the technologies that support knowledge sharing such as databases and intranets). By understanding the intellectual assets an organisation possesses, the organisation can improve its ability to use them to best effect and also to spot any gaps that may exist.

Intelligence Network

Intelligence Network locates, gathers, analyzes and distributes value-added information to enhance competitiveness and help its decision-makers develop forward-looking strategies.

Intelligence gathering is done constantly, with a long-term perspective. It covers a variety of major topics.

Knowledge audit

A method of reviewing and mapping knowledge in an organisation including an analysis of knowledge needs, resources, flows, gaps, users and uses.

Knowledge mapping

A process to determine where knowledge assets are in an organisation, and how knowledge flows operate in the organisation. Evaluating relationships between holders of knowledge will then illustrate the sources, flows, limitations, and losses of knowledge that can be expected to occur.

Knowledge repository

A place to store and retrieve explicit knowledge. A low-tech knowledge repository could be a set of file folders. A high-tech knowledge repository might be based on a database platform.

Learning organisation

An organisation that views its success in the future as being based on continuous learning and adaptive behaviour. It therefore becomes skilled at creating, acquiring, interpreting and retaining knowledge and then modifying its behaviour to reflect new knowledge and insights.

Multimedia

The use of several different media to convey information (e.g. text, audio, graphics, animation, video, and interactivity).

Narrative-based learning

The use of the power of stories and case studies.

Organisational culture

In short, 'the way we do things around here'. An organisation's culture is a mixture of its traditions, values, attitudes and behaviours. Different organisations can have very different cultures. In knowledge management, an organisation's culture is extremely important - if it is not based on qualities such as trust and openness, then knowledge management initiatives are unlikely to succeed.

Pedagogy

The study of teaching.

Presentation components

The aspects of a course that involve making resources available to students. They include course materials and databases, and might consist of textbooks, printed study guides, offprints, and CD-ROMs. The types of resources include documents, diagrams, photographs, audio, video, PowerPoint presentations, and animations.

Problem-based learning (PBL)

Learning that is driven largely by problems (often open-ended) rather than by the transmission of information. It is often associated with teamwork, self-directed learning, and the teacher as facilitator.

Resource database

A database that includes resources, e.g. documents, diagrams, photographs, audio, video, PowerPoint presentations, and animations.

Resource-based learning (RBL)

A pedagogical approach that encourages students to exploit a variety of data sources.

Reversioning

The reuse of course materials for a revised or new course, for a new medium (e.g. the internet or a CD ROM), for a different audience, for use in a different region or abroad. Reversioning can also involve the resizing of a course, for example, breaking it into different sized 'chunks'.

Single-loop learning

Single-loop learning involves using knowledge to solve specific problems based on existing assumptions, and often based on what has worked in the past.

Situated learning

The view that learning should occur in an authentic context, i.e., settings and applications that would normally involve that knowledge. This typically involves social interaction and collaboration.

Social constructivism

The view that learning is a social process rather than a solely individual process. Context, culture, politics, communities, language and shared tools play significant roles.

Student-centred teaching

An approach to education focusing on the needs of the students, rather than those of others involved in the educational process, such as teachers and administrators. Typically, this is taken to mean enabling students to play a role in defining what and how they learn.

Summative assessment

Assessment in which the main aim is to make a judgment about the student’s achievement, often in relation to predefined learning objectives. Complementary to “formative assessment”.

Tutors

In a typical course, those people who facilitate discussion and mark assessments. Sometimes distinguishable from the “course designers”, who create the courses (e.g. those who design the structure, write the materials, and construct the assessment strategy).